CHEMICAL & METALLURGICAL ENGINEERING

McGraw-Hill Co. Inc.

April 7, 1924

25 cents per copy

McGraw-Hill Company, Inc.
James H. McGraw, *President*
E. J. Mehren, *Vice-President*

CHEMICAL & METALLURGICAL ENGINEERING

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Volume 30 New York, April 7, 1924 Number 14

Chemical Industry Must Defend Tariff

SIGNS already are in evidence that a determined effort is afoot to break down the degree of tariff protection which the domestic chemical industry enjoys. In that connection the thought is reiterated that the chemical industry must be just as active in preparing to defend the protection it enjoys as the opponents of the tariff are in building up a case against the duties.

The world's capacity for chemical manufacture was so expanded during the war and during the boom period which followed that the maximum output of all the plants would exceed by 100 per cent the ability of the world to absorb the products. There are, of course, exceptional cases where the manufacturing capacity is not sufficient to meet the demand for certain commodities. In the case of dyes, however, the world's productive capacity probably exceeds the present consumption by 200 per cent. In such a situation as this, it is argued, there must be no lowering of the rates of duty prescribed in the existing tariff act.

Service From Equipment Makers

PART of the service of the maker of chemical engineering equipment is to furnish information and advice to the user of his product. With a wealth of experience in coping with a specific problem and with a large fund of relevant data at his disposal, the equipment manufacturer is in an exceptional position to give advice which, allowing for natural bias, is sound and reliable. He recognizes the fact that service of this kind not only is accepted by the consumer but is the very key to the good will of his clients. Hence it is freely given, although it is not to be confused with engineering service for which a legitimate fee may be charged.

Occasionally, however, an example comes to light which shows that the equipment manufacturer's knowledge and service are not yet fully appreciated. Once in a while we still find a conspicuous example of a production staff trying to solve a problem independently of the knowledge and experience that could readily be obtained from those who make equipment for the purpose. A case in point can be cited of a manufacturer of clay products who encountered a troublesome screening problem and whose staff endeavored to find a satisfactory solution. Two years of independent experimental work resulted in a complicated process that was scarcely satisfactory even on small-scale production. Recently it was determined to expand the business and the local staff decided again to face the issue independently. By mere chance a representative of a well-established firm of engineers and equipment makers heard of the proposed expansion. Being a good salesman as well as an engineer, he succeeded in persuading the local engineers to allow his firm the privilege of investigating the problem and checking up on the efficiency of the proposed plan. One week of intensive work sufficed to show that the method developed on independent lines by the local engineers was inadequate and inadvisable. Thus by mere good fortune the company was saved a needless outlay and learned a better way to accomplish its purpose.

The point to the incident will be particularly clear to those who realize the fundamental character of the unit processes that are used throughout the chemical engineering industries. There are others, however, to whom the lesson must still be driven home. One reason the equipment manufacturer is in such a favorable position to give advice is that he is usually familiar with different applications of the same process in different industries and can bring to bear on any given problem a breadth of knowledge and experience that is not available to the individual operator. Independence is frequently necessary in chemical research and development, but for the solution of ordinary mechanical and physical problems it ceases to be a virtue. One line of progress, at least, is to make use of the service of the equipment manufacturer.

Vicissitudes of Political Life

CONTEMPLATING the political kaleidoscope at Washington and the insecurity of public office, one is reminded that conditions have not changed much in the course of human experience. In his essay "Of Great Place" Francis Bacon, English philosopher and statesman of the sixteenth and seventeenth centuries, moralizes on public servants, their duties and responsibilities. Recent events in our own time confirm Bacon's opinions that in public life "The standing is slippery, and the regress is either a downfall, or at least an eclipse, which is a melancholy thing. . . . Nay, retire men cannot when they would, neither will they when it were reason. . . . Certainly great persons had need to borrow other men's opinions to think with themselves what other men think of them . . . for they are the first that find their own griefs, though they be the last that find their own faults."

These words might have been dedicated to the former Attorney-General, so aptly do they fit Mr. Daugherty's political career. With none of the President's Cabinet has the standing been so slippery as with him, and few men have been so obstinate in refusing to retire "when it were reason." And now that he has gone he ungraciously gives evidence that he is among those who are "the last that find their own faults." Industry will shed few tears over the retirement of Mr. Daugherty. Some of his post-war prosecutions of corporations having large dealings with the government were not only futile and expensive, but unwarranted

in their reflection on the integrity of competent and honorable men who served their country in time of war. But of greater import to industry and trade as a whole has been the obstructing attitude of the Attorney-General toward trade associations, refusing to co-operate in an effort to discriminate between their useful, legitimate activities and their pernicious, illegal acts in restraint of trade. With Mr. Daugherty out of the way it is to be hoped that the shadow of uncertainty will be removed from the realm of trade associations and a new impetus given to the constructive work that Mr. Hoover would have them do. It is to be hoped further that Harlan Fiske Stone, the new Attorney-General selected by President Coolidge, will prove to be a man of broader sympathy and more constructive activity.

Figuring Fertilizer Costs Rationally

THE real cost of fertilizing a given crop is not determined by the cost of the fertilizer applied to it. It is properly determined only by an estimate of the amount of money needed to replace in the soil the plant food constituents removed in the crop, so that the soil will remain as valuable after as before the growing season.

Calculating on this basis, some very strange relations are sometimes found, as, for example, if one figures the real cost of fertilizer constituents for a hundred-bushel corn crop. According to good authority, such a crop would remove in grain and stover approximately 71 lb. of potassium, 148 lb. of nitrogen and 23 lb. of phosphorus per acre. These constituents can be figured at $16 per ton for 16 per cent acid phosphate, $60 per ton for 15 per cent nitrate of soda, and $37 per ton for 37 per cent muriate of potash. Or, respectively, 12 cents per pound for phosphorus, 20 cents per pound for nitrogen and 5 cents per pound for potassium. On this basis each bushel of corn requires that there be added to the soil 2.76 cents worth of phosphorus, 29.6 of nitrogen, and 3.5 of potassium.

Any other crop can be similarly figured and in almost every case it will be found that the nitrogen is the expensive fertilizer constituent in the crop removed. It will pay the fertilizer industry to teach the agricultural community to think on this basis rather than on the cost per acre or cost per year. It certainly is the cost per bushel or per ton of crop for each constituent removed from the soil that deserves attention.

Spurious Tonics For Motor Fuels

MORE than once we have been amazed at the host of imitators, who, like the camp followers of prospecting days, are attracted by the "pay dirt" of the successful inventor. Only recently we have observed such a trend in the motor fuel industry, particularly in the case of the so-called "dopes" and "tonics" added to gasoline to increase its power or to lessen its tendency to produce knocking.

Scarcely had tetra-ethyl lead emerged from the research laboratory than rumors were heard of contemporary discoveries, secret modifications of the original idea; and of course all were improvements. By the time arrangements had been completed for the commercial distribution of ethyl gas, its imitations had made their appearance and more or less open attempts were made to market them. The oil companies and the larger gasoline distributors were approached. The promoters sought out men in the oil industry with a smattering knowledge of the technical development and solicited assistance in marketing their spurious wares. From time to time some of these men or the companies approached have turned to *Chem. & Met.* for counsel and uniformly our advice has been for them to submit the products to the acid test of performance. Facilities for carrying out these tests scientifically, however, have not always been available except in the laboratories of those interested in competing products.

Now comes the announcement that the Bureau of Standards is willing to take a hand in the matter. The motor fuel laboratory under Dr. H. C. Dickinson is in a position to be of service in determining the real worth of these products and quickly eliminating those whose value exists only in the prospectus of the fraudulent promoter. Dr. Dickinson says: "We may not be able to settle all the claims of these promoters, but we can quickly settle the question whether or not a given compound gives gasoline more power and eliminates knocking. We shall be glad to do our best and help all we can in testing such compounds and certifying results. We have a well-equipped laboratory and an expert staff."

The oil industry will do well to take advantage of the bureau's offer of service. To eliminate the quack and his counterfeit product at this time is to clear the way for earlier and more favorable reception by the public of the genuine anti-knock motor fuels.

The Intrinsic Value Of Scientific Facts

THE X-ray spectrometer has taught us much regarding the constitution of matter, especially metals, and it is now being used to some extent commercially for the inspection of metals. Many feel that this apparatus is where the metallurgical microscope was 10 or 15 years ago; that it is becoming an implement of general application as a means of examining metals industrially. This is undoubtedly true, but it is quite probable that this improved means of inspection is but a small part of the advantage that will be derived from the work being done along this line. For in addition to finding out usable facts regarding the specimens he examines, the X-ray worker now and then discovers incidental phenomena of no apparent usefulness—and nothing holds quite as much promise as an apparently useless minor phenomenon.

About 30 years ago Thomas A. Edison discovered what is called the Edison effect—that an electric current can be passed in one direction between a plate in an incandescent lamp bulb and the hot filament, but not in the opposite direction. For 20 years no important use was made of this fact; it was a fragment of apparently useless knowledge. But when the electronic theory became well understood an adequate explanation was provided and before long this "useless" fact became a most useful one. It was suggested that the Edison effect was due to the flow of a stream of electrons from the filament to the plate, and on this assumption Dr. Lee De Forest conceived the idea of introducing a third element into the bulb, a grid between the filament and the plate, which made possible a "trigger action" whereby a large current between the plate and the fila-

ment could be controlled by small changes in the potential of this grid. The result has been radio as we know it today, long-distance telephony and other great developments depending on the vacuum tube for their existence.

Every little piece of scientific information, however useless it may seem at the time of its discovery, has potential value. Some day it will fit in with other apparently unrelated bits of knowledge to yield industrial results of unpredictable value.

Stopping Dust Hazards At Their Source

GRAIN elevator operators have learned that the only way to control dust explosions is to see to it that there is no dust about the elevator. As a consequence considerable attention is being given to dust-collecting systems for use at all hoppers, elevating equipment and grain-handling parts where the highly explosive grain dust might escape.

The chemical engineering industries have a similar problem in many cases, and the only way to meet the problem is to face the facts squarely. The dust should be eliminated at its source, not allowed to scatter within or without the building and thus settle down upon every available ledge or other horizontal surface. Very often it is this dust that has settled out of the air during previous weeks or months that causes the greatest damage in case of accident. The initial explosion or puff may be slight, causing little direct damage; but it is usually big enough to stir up all such accumulated dust and produce an explosive mixture in the air that has tremendous possibilities of damage when it subsequently ignites. Chokes in conveyors, dust-collecting hoods and fans and above all good housekeeping are a small price to pay for security against dust hazards.

Use and Abuse Of Inspection

AN OUTSIDE inspector is sometimes unwelcome in a plant because his visit necessarily means an interruption of routine, and therefore delay or extra cost. However, when a commodity or device is sold on the basis of specifications, it is often essential to make the inspection for acceptability of the product. Under such circumstances the work should become a matter of co-operation between buyer and seller, not a sleuthing effort based upon any assumption of attempted fraud or deception.

These generalizations are suggested by a report of the method of inspection adopted recently by one of the government departments in examining a certain commodity that is purchased in large quantity. The events followed the appointment of a new inspector who, according to the custom of new brooms, swept very clean. This man apparently went at his job on the supposition that the company was attempting to deceive him and defraud the government. He insisted that great piles of shipping cases be moved about in order that he could open and inspect the contents of those in the center of the pile. His whole attitude was that of the dime novel detective, and as a result this company is strongly disposed never again to bid on government orders.

This lone instance would not be worthy of mention were it not typical of an inspection method too frequently employed. Back of it may lie a faulty method of purchasing. The purchasing agent of a company of any standing cannot afford to deal with concerns in which he has no confidence. No matter how low the price, an irresponsible bidder is never the most attractive. If this principle is observed in letting contracts, there is no excuse for annoying methods of inspection. Dealings with a reputable company should never require such a procedure. A thorough inspection is, of course, proper and is expected by the selling company; but unnecessary detail in inspection amounts only to nuisance and serves to protect neither buyer nor seller.

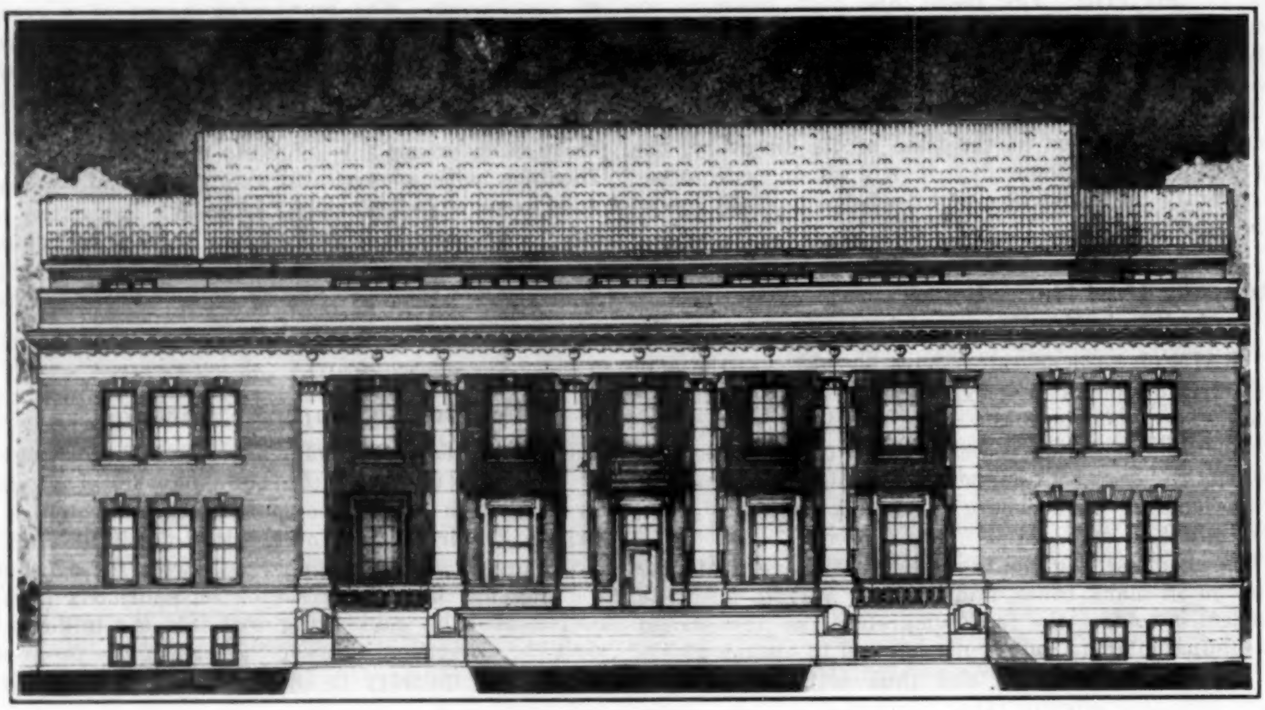
A Special Invitation to The British Empire Exhibition

JUDGING from the columns of our English contemporaries, the scientific and industrial talents of Great Britain are at the moment concentrated on the British Empire Exhibition shortly to open at Wembley. Great preparations are under way with the expectation that during the coming season an enormous influx of people, probably numbering well into the millions, will visit the exhibition in order to learn of the progress of science and industry in the vast empire on which the sun never sets.

The chemist and the engineer have had an important part in the arrangements. Thus *Chemistry & Industry* points to three pieces of work on which many of its readers have labored assiduously for many months. There are the interesting and instructional displays of chemical manufacturers, the scientific exhibit in which chemistry is scheduled to play a leading rôle, and finally there is being recorded in the form of a book a summary of the present status of chemical knowledge and particularly the contributions made by British chemists during the past century. The chemical section of the exhibition is to occupy a prominent place in the Palace of Industry, a vast structure of concrete and steel completed last November. An interesting account in the *Chemical Age* (London), which is reprinted elsewhere in this issue, shows how well the chemists are making use of the 30,000 sq.ft. of floor space that has been allotted to them.

Our English colleagues have asked American chemists and chemical engineers to look upon the exhibition at Wembley as a welcoming introduction to the British chemical industries. They have urged all who are contemplating a trip to Europe during the next 6 months to make certain that adequate provision is made to attend the exhibition. This event, which will be unique in the history of science and industry in Great Britain, should hold many interesting and perhaps profitable attractions for American visitors.

Furthermore, we are commissioned by the London office of the McGraw-Hill Co., as well as by our own British correspondent, to speak an additional word of welcome to those of *Chem & Met.'s* readers who are planning to attend the exhibition. Our representatives in Great Britain are anxious to be of service in such matters as helping to secure hotel accommodations or arranging conferences with representatives of industrial organizations or the various scientific and technical societies. It will be a real pleasure to forward to our London representatives the names and addresses of those of our readers who are able to accept the invitation so enthusiastically tendered by our British chemical colleagues.



A Great Temple of the Future

Proposed National Institute for Research in Colloid Chemistry

IN 1920 the Milwaukee Sewerage Commission was in trouble. The new 20 million dollar disposal plant was not efficient. In fact, it was essential to increase the operating efficiency by 2,000 per cent in order to make the project successful. The difficulty lay in the dewatering of the waste activated sludge. In the face of this difficulty a distinguished colloid chemist, Dr. John Arthur Wilson, was asked to undertake the problem, which in colloid parlance resolved itself into discovering conditions for a minimum swelling of the organized jellies and a maximum degree of aggregation of the dispersed material. Three things Dr. Wilson worked out: First, by controlling the hydrogen-ion concentration to a definite optimum, he increased the efficiency 400 per cent. Then, by adding alum, he coagulated the negatively charged sludge with the polyvalent positive ion and raised the efficiency to 650 per cent. Finally, by studying temperature, he found that the above-mentioned controls at 160 deg. F. would give an increase of 4,000 per cent in dewatering efficiency. This was twice the necessary increment and all accomplished by the intelligent application of fundamental principles of colloid chemistry.

Back in the grim days of the war, thousands of men died in the hospitals of wounds after they had lain in the inferno of No Man's Land for long periods. Great loss of blood prevented the heart from maintaining the critical blood pressure. Not even saline injections helped, for the salt was rapidly eliminated from the system. Then a man who had been studying the applications of colloid chemistry to medicine—Dr. Bayliss of the University of London—advanced the idea of using colloids to hold the water in the cells. Gelatin and gum acacia intravenously injected saved more than 20,000 lives. One idea and 20,000 lives!

The scene shifts again, to the great Southwest, where an insect had made large sections of the country unsuitable for cattle raising. The most promising cure for the blight—the cattle tick—was sodium arsenite. This, however, applied as a water solution had a ruinous effect on the cattle and, because it did not wet the oily skin of the animal, did not kill the insect. Colloid chemistry again solved the problem. With an oil emulsion mixed into the solution its wetting power was increased and the tick was destroyed, whereas the cattle were not harmed.

If a field of scientific endeavor had only the success of these three achievements to plead for its support, there ought to be no question of the response. In fact, if there had never been an application of colloid chemistry to industry, to medicine or to agriculture, it would deserve the support of the thoughtful, because it deals with finely divided material suspended in other material. In this wide category belong, first and most important, the chemical processes

of the human body. The selective absorption of food and of oxygen, the structure of muscles and tissues, the body fluids—all these are colloid systems and the more intelligent understanding and care of the human body will inevitably result from a study of the fundamentals of colloid chemistry. In like manner agriculture and animal husbandry, because they too deal with organisms, from the very nature of things are intimately dependent for their future development on colloid study. And in industry not only in handling those products of animal and vegetable life such as leather, soap, paper and rubber has colloid chemistry proved invaluable but also in the production and use of metallic alloys, of cement, of ink, of dyed fabrics and of a hundred other materials.

These are all problems of finely divided materials suspended in other materials, or, in other words, of colloid chemistry. But we have up to the present time merely named this great field of endeavor and begun the study of such phenomena. We are like prospectors knowing of the wealth that lies over the range of hills that mark the boundary of our present knowledge, pleading that the tools to make this wealth available be supplied us.

Through the energy and vision of some pioneers we now have a definite constructive plan for the aggressive exploitation of this area so rich in promise and already so fruitful in accomplishment. It is a plan to found an "Institute of Colloid Chemistry."

The National Research Council has sponsored the plan and the National Academy of Sciences has indorsed it. In addition educators and scientists of national prominence have expressed their enthusiasm for it.

Such an institute would have the stability and prestige that are necessary for carrying out research in such a field. It would be called the National Institute for Research in Colloid Chemistry and it would be governed by a board of seven trustees appointed as follows: one by the National Research Council, one by the president of the American Chemical Society, one by the Federation of Societies for Experimental Biology and Medicine, one by the president of the American Physical Society, one by the donor (or donors), one by the president of the co-operating university. These men would direct the spending of the interest of the endowment, which it is estimated should be $37,500 (5 per cent of $750,000). In addition, the building and equipment sufficient for forty to fifty workers would cost $250,000, making a total of $1,000,000 needed for the project.

The staff of the institute itself should consist of a research director, a man of international reputation in the field of colloids, and several assistants. It is planned to have a director of the laboratories who will take care of the business details and assist in the direction of research. Two senior fellows who have attained the doctorate and a number of junior fellows complete the staff. Special facilities for colloid work will be available, instruments and equipment that do not exist anywhere else in the country. Investigations will thus be achieved in less than a month that would take a year or more even if funds were available for the necessary equipment.

> "Take interest, I implore you, in those sacred dwellings which one designates by the expressive term: Laboratories. Demand that they be multiplied, that they be adorned: these are the temples of the future—temples of well-being and of happiness. There it is that humanity grows greater, stronger, better."
>
> —*Louis Pasteur.*

The university at which the institute is located should provide (according to the suggestion of the National Research Council) a suitable building site, maintenance of building and equipment, service such as heat, light, janitors, stenographer, mechanic and glass blower and a fund of $10,000 per year for apparatus. In addition the fellows of the institute should be exempt from laboratory fees and their work should be credited toward higher degrees in the graduate school.

The University of Wisconsin has expressed a strong desire that the institute be located at Madison. Already such co-operation as is necessary to the success of such a venture has been accorded the Forest Products Laboratory. Already by reason of the great interest on the part of the faculty, by reason of Professor Svedberg's memorable semester there in 1923 and by reason of the most successful symposium held there last June, the University of Wisconsin has come to be looked on as a center of colloid work. Finally, Madison is a place of great physical beauty and enjoys a fortunate all-year-round climate. This is of importance in connection with summer work, which it is hoped would be a unique feature of the institute. Madison could become for colloid chemistry what Woods Holl is for biology—a summer Mecca for research workers.

To Dr. J. H. Matthews of the University of Wisconsin, whose enthusiasm and far sightedness are responsible for the inception of the idea; to the members of the committee on colloids of the National Research Council, who have so consistently supported the idea; to the executive committee of the National Research Council for the intelligent indorsement that constitutes the most influential sponsorship; to the University of Wisconsin for the generous offer of support both moral and financial—to all of them the chemists and the engineers of the country owe an unpayable debt. Indeed, the whole nation must share the obligation, for such an institution is most truly a national institution. The institute can be made an actuality, vital and beneficent, with a gift of a million dollars. Isn't it possible that you know an individual or a group of men that are in a position to give this money? Here is a concrete way in which you can help. Sell the great value of your own profession in a way that will benefit it and humanity. Help to create an institution that will influence almost every industry and individual in the country.

A Survey of Products That Afford

Industrial Outlets for Chlorine

This Article, the Second on the Subject, Deals With Chloroform and the Metallic Chlorides Both in Regard to Method of Production and Market Statistics

By Paul S. Brallier
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CHLOROFORM is another product the manufacture of which is quite essential but which utilizes only a small proportion of the total chlorine production.

A large part of the chloroform produced in this country is made by the action of hypochlorites, usually bleaching powder, on either acetone or alcohol. Acetone is the more favored base material here in spite of its present high prices. Phillips (20)* proposes the use of secondary alcohols, prepared by passing unsaturated hydrocarbons, rich in propylene, into sulphuric acid, and subsequently hydrolyzing the resultant alkyl sulphates. He adds 1 part of these alcohols to a mixture of 5 parts bleaching powder and 2 parts water, and distills off the chloroform.

Feyer has described experiments on the production of chloroform from acetone or ethyl alcohol in an electrolytic cell (21). Ochi (22) proposes to make chloroform by introducing chlorine into a mixture of milk of lime and acetone, ethyl alcohol, or acetaldehyde, the chloroform being continuously distilled. This would be economical from the point of view of lime consumption, since all but a very small amount of the lime could be utilized. Thus:

Chloroform—Production and Price Data

Year	Lb. Made	Approx. Average Price Cents Per Lb.
1904	616,670	27
1909	1,869,685	26
1914	1,333,954	22
1916	....	55.4
1917	....	61.4
1918	....	66.2
1919	1,677,641	39.1
1920	....	36.7
1921	944,300	41.0
1922	....	33.6
1923	....	33.5

$$2(CH_3)_2CO + 4Ca(OH)_2 + 6Cl_2 = 2CHCl_3 + Ca(CH_3.CO_2)_2 + 3CaCl_2 + 6H_2O$$

When bleaching powder is used, one third of the lime used in making the bleaching powder is liberated by the action of the acetone:

$$2(CH_3)_2CO + 6CaOCl_2 = 2CHCl_3 + Ca(CH_3.CO_2)_2 + 2Ca(OH)_2 + 3CaCl_2$$

Introducing chlorine instead of bleach would also permit of very close temperature control.

Very high yields of chloroform are claimed for the process of slowly chlorinating cold-stirred ethyl alcohol until the specific gravity reaches 1.32 (23). Of the chlorinated product 100 parts are added to a mixture of 500 parts bleaching powder, 100 parts slaked lime and 2,000 parts water. Heat is applied and the chloroform slowly distilled over.

Utheim (24) proposes the use of acetaldehyde, which may be obtained from acetylene, as a base material for chloroform manufacture; and the Norsk Alkali A-S in Norwegian patent 30,590 discloses the use of mono- or di-chloracetaldehyde or a mixture of the two for the same purpose. The process of chlorinating natural gas referred to in discussing carbon tetrachloride may be so controlled as to yield chloroform.

Dow and Quayle (25) have patented the process of making chloroform by the reduction of carbon tetrachloride with iron, in the presence of water. Sufficient iron is added at the beginning of the operation to reduce the entire amount of CCl_4, the temperature is maintained at about 25 deg. C. and the reaction mass is kept under reduced pressure so that the chloroform distills over as formed. This reduction is said to be very slow, and reduction products other than chloroform are obtained even under the most favorable conditions. Nevertheless, it is understood that a considerable amount of chloroform is made in this way.

To pass the United States Pharmacopœia standards of purity, chloroform obtained by any of the above processes must be purified. This may be done, according to Michaelis (26), by agitating 100 parts chloroform with 33 parts of 66 deg. Bé. sulphuric acid, until a sample of the chloroform no longer discolors fresh acid when shaken with it for 5 minutes. The chloroform is then separated from the colored acid, mixed with 33 parts fresh acid, and the mixture heated with refluxing of the choloroform and agitation for 4 hours. The choloroform is then separated, treated with alkali, dehydrated and distilled and the final product "doped" with 1.5 to 2.0 per cent absolute alcohol as a preservative.

Aluminum Chloride

Aluminum chloride does not at the present time absorb a great deal of chlorine; but, as has been pointed out before, it has great possibilities. Census data indicate a production of 4,265 tons in 1919, and 4,351 tons in 1921. However, the valuation given is at the rate of 4 to 5 cents per pound, indicating that a large part of this product must have been sold as a solution, which is not primarily a chlorine product but derived from hydrochloric acid. Production of the anhydrous chloride has been almost entirely from metallic aluminum in one form or another, and chlorine;

*Figures in parentheses in the text refer to bibliography at end of article.

but even the cheapest metal available is too high priced a material to permit the extensive use of the chloride from this source. Bauxite or some other cheap aluminum-bearing material must be the starting point for the large-scale production of aluminum chloride. The problem of utilizing these cheap raw materials is not so much a chemical one as a matter of equipment design. Aluminum chloride was made in quantity from bauxite as early as 1854 by Deville, and its production was continued until the Hall process afforded a more economical means of recovering metallic aluminum. The problem is to replace the fireclay gas retorts of 1880 with chlorinating furnaces having capacities of 5 or 10 tons of chloride per day.

Nevertheless each year brings a fresh crop of patents on processes for making aluminum chloride. Thus British patent 113,278 covers a process of treating plagioclase rock and carbon with chlorine or HCl at 600 to 1,000 deg. British patent 163,975 discloses a process of treating a mixture of aluminum oxide, carbon and aluminum with chlorine, the action of the chlorine on the metal generating sufficient heat to bring about reaction among the oxide, carbon and chlorine. The reaction is to be effected in an iron retort lined with a mixture of coke dust and pitch or tar, and heat insulated on the outside. Venable and Jackson (27) have found that a mixture of CO and chlorine gives very good results in the chlorination of oxides, and state that, using CO in excess, aluminum oxide could be chlorinated at 450 deg. C. Alexander in U. S. patent 1,366,626 proposes to make aluminum chloride by injecting pulverized aluminum oxide, fuel such as finely divided carbon, together with gas to support combustion, and chlorine into a combustion and reaction chamber. British patent 160,759 covers a process of chlorinating aluminum nitride in a tube furnace packed with briquets of the nitride. The furnace is first heated internally by burning gases in it, and when the proper temperature has been reached, the fuel gas is turned off and chlorine turned on. Continuous operation is maintained by adding fresh briquets at the top of the furnace and raking out the residue at the bottom.

Wolcott in Canadian patent 217,051 claims a process of mixing some aluminum silicate material and oil shale or low-grade coal, heating to distill or burn off hydrocarbons, and heating the residue with chlorine. Burgess in U. S. patent 1,405,183 discloses a process of producing aluminum chloride by continuously feeding finely divided aluminum carbide into a current of hydrochloric acid gas, leading the mixture to a reaction chamber and heating to start the reaction. Hall in U. S. patent 1,405,115 forms the chloride from Al_2O_3, sulphur and chlorine by heating them together. In a subsequent patent, 1,422,568, he specifies that powdered aluminum oxide is to be blown into an atmosphere of chlorine and sulphur. McAfee in Canadian patent 222,321 recovers the aluminum chloride from hydrocarbon (oil cracking) residues by heating to from 950 to 1,800 deg. F. and condensing the chloride so released. Aluminum carbide may be added to the residue and chlorine may then be passed over the material that remains after the sublimation of the chloride. The same patentee in Canadian patent 222,309 cokes a well-incorporated mixture of finely divided aluminum oxide or bauxite and treats with chlorine. King and Roberts in Canadian patent 222,315 propose to mix producer gas in excess of 1,000 deg. C. with chlorine and bring this hot gaseous mixture in contact with aluminum oxide. A somewhat similar idea is contained in Canadian patent 222,318, granted to L. S. Abbot. In this case, the chloride residues from oil refining are treated with a current of preheated chlorine. The chlorine is heated by passage through a bed of stripped residue through which air has previously been drawn. Finally, Smith and Essex in Canadian patent 222,320 disclose a process of treating aluminum carbide with chlorine at a temperature sufficient to sublime the chloride formed. The reaction temperature is kept below 200 deg. C. by cooling.

This does not purport to be a complete list of aluminum chloride patents in recent years, but it contains only the more reasonable propositions.

> The first article in this series discussed the production of bleach, liquid chlorine and carbon tetrachloride. The survey is continued in this article and includes a discussion of chloroform, and the chlorides of aluminum, zinc, tin and sulphur. The viewpoint of a survey of technical literature is maintained, interpreted in terms of an intimate acquaintance with the chlorine field and balanced with the statistical resources of the tariff surveys.

Zinc chloride offers a possible outlet for considerable quantities of chlorine, but brings the chlorine manufacturer in direct competition with the hydrochloric acid producer, since practically all the zinc chloride now made is prepared by the action of HCl on zinc oxide, carbonate or various forms of secondary metal such as galvanizer's dross or zinc scrap.

The old Swinburne-Aschcroft process of preparing the anhydrous chloride by passing chlorine over the heated sulphide ore has apparently never been successfully carried out on a large scale. A crude zinc chloride containing up to 98 per cent $ZnCl_2$ has been made, however, by bubbling chlorine through molten zinc, the chloride being allowed to accumulate on top of the metal bath and being tapped off from time to time.

Zinc Chloride—Production and Price Data

Year	Lb. Made	Approx. Average Price Cents Per Lb.
1917	....	11.76
1918	....	14.31
1919	74,089,063	13.31
1920	....	12.90
1921	75,291,500	10.16
1922	....	6 58
1923	....	6.58

By suitable refining, the blue-gray product may be converted to a pure white, anhydrous chloride containing well over 99.5 per cent $ZnCl_2$.

Storey in U. S. Patent 1,314,715 discloses a process of preparing a zinc chloride solution by passing chlorine gas up through a tower containing some form of metallic zinc, over which water or zinc chloride solution is dripping.

Tin chloride appears on the market both as the tetrachloride and as the bichloride. The tetrachloride is usually sold as a water-white, fuming liquid, and

the bichloride in the form of crystals. The total production of all tin chlorides for 1919 was 8,999,416 lb., and for 1921, 2,988,000 lb. The bichloride is obtained by reducing the water solution of the tetrachloride with tin. A large proportion of the tetrachloride is obtained by the Goldschmidt process of detinning tin scrap, in which the cleaned and dried scrap, after compression into bundles, is treated with dry chlorine, cooling being provided to keep the temperature below the point at which iron is attacked (28). Kugelgen has obtained Canadian patent 178,771 on a very similar process.

In spite of the apparent cheapness of this detinning process, the tin market until a short time ago permitted the production of the tetrachloride from pure tin and chlorine. Ochi (29) has studied the action of chlorine on tin. He reports that the gas used must be dry, and that the best temperature is 114 deg. C. He suggests the use of sulphur chloride as a chlorinating agent, and says that any excess of the chloride may be readily removed by boiling and distilling with anhydrous tin bichloride. He states that the use of sulphur chloride as a catalyst when tin and chlorine are caused to react accelerates the action. Torrosian (30) has found that $SnCl_4$ precipitates asphaltic and resinous substances and certain sulphur compounds from crude petroleum and its distillates, and suggests that it may be used as a reagent for showing the extent of refining to which the oil has been subjected.

Antimony trichloride has a limited market, the production in 1919 being 103,466 lb. Williams in U. S. patent 1,425,565 describes a process of making antimony trichloride solutions by acting upon antimony with chlorine at 60 deg. C. in the presence of HCl in sufficient concentration to prevent the separation of oxychloride. Ralston, according to U. S. patent 1,384,918, makes the anhydrous trichloride by passing chlorine through crushed antimony submerged in a bath of the fused trichloride. The chlorine is supplied rapidly enough to keep the $SbCl_3$ molten, due to the heat of reaction. The trichloride formed is withdrawn either in liquid or in vapor form, and is refined by subsequent distillation.

Sulphur chloride is sold either as yellow or as red, the specifications being rather loosely drawn. The yellow chloride, as a rule, contains about 4 per cent "free sulphur," while the red product contains a slightly higher percentage of chlorine than is required for the formula S_2Cl_2.

Sulphur Chloride—Production and Price Data

Year	Lb. Made	Approx. Average Price Cents Per Lb.
1917	....	7.12
1918	....	7.25
1919	2,353,807	6.25
1920	....	5.75
1921	....	5.87
1922	....	4.75
1923	....	4.75

Gegenheimer and Mauran, according to U. S. patent 1,341,423, have found that sulphur chloride may be made by bubbling chlorine through a bath containing free sulphur dissolved in sulphur chloride, at a temperature sufficient to maintain the vapors above the reaction mixture at a temperature of about 138 to 140 deg. They state that instead of pure sulphur monochloride, a mixture of sulphur and sulphur monochloride or of sulphur mono- and di-chlorides may be obtained by appropriately varying the depth of mixture through which the chlorine is passed, the rate of flow of the chlorine and the temperature.

Pope and Heycock in British patent 142,879 claim the use of absorbent charcoal as a catalyst for facilitating the combination of chlorine and sulphur monochloride to form sulphur dichloride.

Meigs (31) states that sulphur monochloride acts on artificial and natural asphalts and lubricating oils with evolution of HCl. He proposes it as a reagent for determining the relative stabilities of lubricating oils.

Mashino (32) has found that acetic anhydride may be prepared from sodium acetate and sulphur monochloride. The conditions for the reaction are a temperature of 100 deg., a reaction period of 2 hours, and a 2 to 6 per cent excess of sodium acetate over that required for the sulphur chloride. Antimony is used as a catalyst, 5 per cent of the weight of the S_2Cl_2 being added. Under these conditions, 78.7 per cent of the sodium acetate and 80.6 per cent of the sulphur chloride are utilized. Tin, iron, stibnite and iron sulphide give somewhat lower yields when used as catalysts. Glacial acetic acid, calcium or ammonium acetates cannot be substituted for the sodium salt.

Silicon and titanium tetrachlorides and arsenic trichloride were manufactured extensively for military purposes during the war, but have found no considerable commercial application up to the present time. Hutchins in U. S. patent 1,271,713 states that silicon tetrachloride may be prepared by passing dry chlorine over silicon carbide, heated to at least 1,000 deg. C. External heating may be discontinued when the reaction is well under way. Titanium carbide is similarly used in making titanium tetrachloride.

Arsenic trichloride is obtained as a byproduct when cobalt-nickel arsenical ores are treated with chlorine. It was made at Edgewood Arsenal during the war by the action of sulphur monochloride on white arsenic at 100 to 140 deg. C. (33), and by the action of phosgene on white arsenic in the presence of carbon (filtchar) as a catalyst at 200 to 260 deg. (34).

Phosgene and chlorpicrin are two other war compounds with limited peace-time uses. The French evidently favored the process of decomposing CCl_4 with sulphuric acid at 150 deg. C. in making phosgene (35), the $COCl_2$ being recovered from the resulting gas mixture by absorption in CCl_4 and subsequent boiling off. In this country practically all the phosgene was made by the direct union of CO and chlorine in the presence of activated charcoal as catalyst. The $COCl_2$ was condensed by cooling to —20 deg. C. To prevent excessive losses by this method, it was necessary to have the carbon monoxide used nearly free of other gases. Bradner (36) has recently proposed the use of a rich producer gas, containing 27 per cent CO and 60 per cent nitrogen. He mixes this gas, after drying it over sulphuric acid, with the theoretical volume of chlorine, passes the mixture over the catalyst, and leads the resulting vapors through a chamber filled with adsorbing material such as silica gel, which should be kept preferably at a temperature of from 5 to 10 deg. C.

Chlorpicrin, according to Sweeney (37), is prepared by the interaction of two aqueous solutions, one formed of picric acid and lime or other alkaline substance, and the other of bleaching powder, sodium hypochlorite or chlorine. Chlorpicrin has been found to be an excellent germicide (38). In the proportion of 20 grams to each

sack, it has been used to disinfect cereals, and the treatment has not affected the technical or food value of the cereal, although it does diminish the germinating power. According to experiments made in French stations during 1921-22, chlorpicrin kills the pink boll worm. A dose of 30 c.c. per cubic meter of cotton seed gives disinfection to seeds confined in a closed space for 24 hours, without sensibly affecting their germination.

Selenium oxychloride is a material the very interesting properties of which have recently been announced by Lenher (39). It may be prepared from selenium tetrachloride, which in turn is made by chlorinating selenium suspended in CCl_4, the Se_2Cl_2 first formed being a very good solvent for selenium (40).

List of References

(20) U. S. Patent 1,359,099.
(21) *Zeitschrift für Elektrochemie*, vol. 25, pp. 115-45.
(22) Japanese Patent 38,179.
(23) *Journal of Chemical Industry* (Japan), vol. 21, pp. 219-26.
(24) British Patent 116,094.
(25) U. S. Patent 1,311,329.
(26) U. S. Patent 1,203,032.
(27) *Journal*, Elisha Mitchell Scientific Society, vol. 35, Nos. 3 and 4.
(28) *Met. & Chem.*, vol. 17, pp. 187-189.
(29) *Journal of Chemical Industry* (Japan), vol. 23, pp. 583-94.
(30) *Journal Ind. Eng. Chem.*, vol. 13, pp. 903-4.
(31) *Journal Ind. Eng. Chem.*, vol. 9, pp. 655-8.
(32) *Journal of Chemical Industry* (Japan), vol. 24, pp. 1023-39.
(33) *Journal Ind. Eng. Chem.*, vol. 11, p. 109.
(34) *Journal Ind. Eng. Chem.*, vol. 12, p. 221.
(35) *Compt. rend. de l'academie des sciences*, vol. 169, pp. 34-6 also pp. 17-20.
(36) U. S. Patent 1,457,493.
(37) U. S. Patent 1,413,198.
(38) *Rend. accad. sci. Napoli*, vol. 26, p. 77.
(39) *Journal American Chemical Society*, vol. 43, pp. 29-35; vol. 44, p. 1664.
(40) *Journal American Chemical Society*, vol. 42, pp. 2498-2500.

Rules for Safe Handling of Cylinders*

Oxygen

1. Compressed oxygen plus oil is explosive. Allow no oil or grease of any kind to come in contact with valve, regulator or any other portion of the cylinder or apparatus.

2. When shipping empty oxygen cylinders to manufacturer, lower portion of green tag attached to cylinders should be removed at the perforated line. Any green sticker label found pasted to the cylinder should be removed. Bill of lading should specify that the cylinders are empty and serial numbers of the cylinders should be noted thereon.

3. Cylinders of oxygen, except those in actual use and in excess of approximately one day's supply required in any one department or point about the shop, should be stored in a place where they will not be tampered with by unauthorized persons.

4. Oxygen cylinders should be stored in a safe, dry place, where they will not be exposed to the heat of stoves, radiators, furnaces, or in the direct rays of the sun. Heat will increase the pressure and it may cause the safety plug or disk to melt or blow, thus allowing oxygen to escape, resulting in waste. If the escaping oxygen comes in contact with even the smallest flame it has such a tremendous influence upon combustion that a quick ranging fire is likely to result.

5. Cylinders of oxygen are never to be stored in the same room used for the storage of calcium carbide, cylinders of dissolved acetylene or other fuel gases, or with acetylene generators.

6. Open flames of any description shall not be employed in any building used for the storage of oxygen cylinders.

7. If cylinders are stored on the ground or open platforms, such locations should not be adjacent to points where there is a large amount of combustible material.

NOTE:—While oxygen itself will not burn, its effect in aiding combustion, once a blaze is started, makes it important that rules 4 to 7 inclusive be carefully observed.

Acetylene, Hydrogen, Etc.

1. When cylinders of dissolved acetylene, hydrogen, liquid fuel gases or vapors are not in use, outlet valves shall be kept tightly closed, even though cylinders may be considered empty, and valve caps replaced.

2. Cylinders should be stored in a safe, dry, well-ventilated place, where they will not be unduly exposed to the heat of stoves, radiators, furnaces, or the direct rays of the sun. Heat will increase the pressure, or it may melt the fusible safety plug with which most cylinders are provided and which melts at a temperature of approximately 212 to 220 deg. F.

3. No open flame, grinding tools or spark-emitting devices shall ever be used within the storage building or compartment, and all artificial lights shall be incandescent electric and shall be installed in accordance with the "National Electric Code for Rooms in Which Inflammable Vapors May Exist."

Electric light switches, telephone and all other apparatus which may cause a spark must be located on the outside of building.

All lamps shall be inclosed in vapor-proof globes of the Marine type.

4. Cylinders of dissolved acetylene shall always be stored standing upright with valve end up.

5. When shipping empty dissolved acetylene cylinders and other fuel gas cylinders to manufacturers, lower portion of red shipping tag attached to cylinders should be removed at the perforated line. Any red sticker label found pasted to a cylinder wall should also be removed. Bill of lading should specify that the cylinders are empty, enumerating the type and individual numbers of such cylinders.

Under no circumstances attempt to transfer acetylene from one cylinder to another and never under any conditions attempt to compress acetylene into a cylinder. This work should only be performed by acetylene charging plants, and under conditions which comply with Interstate Commerce Commission regulations.

General Rules

1. Oxygen cylinders and acetylene, hydrogen or other fuel gas cylinders shall not be transported or lifted by crane or derrick except when they are in a cradle or substantial stand, and cylinders shall never be handled with electromagnets or with rope or chain slings.

2. Cylinders should be handled carefully, should never be dropped, and should be placed so they will not fall nor be struck by other objects. Knocks, falls or rough handling are likely to damage the cylinder, valve or fuse plugs, and cause leakage, and may even result in an explosion.

3. When exhausted, cylinders shall be returned as rapidly as practicable to the storage building or place, and from there to the manufacturer. Empty cylinders should be marked "Empty" and stored apart from full cylinders to prevent confusion. Valve protection caps must be replaced.

*Compiled by Gas Products Association.

An "Empty" Tank Explodes

Experience at Picatinny Arsenal Emphasizes Need of Caution in Salvaging Nitrocellulose Equipment

By George R. Ensminger
Lieutenant, Ordnance Department, U. S. Army

Here is a comprehensive engineering report of an accident that should carry with it several valuable lessons for the chemical engineer. There is not only the general warning against the careless handling of used equipment but also a specific study of important operating details in the alcohol dehydration of nitrocellulose.

AT Picatinny Arsenal on April 26, 1923, a small tank, empty to all appearances, exploded upon being struck by a steel chisel. The explosion resulted in the shattering of one employee's left arm, making amputation at the elbow necessary, the burning of another employee's face and hands, from which he recovered after 13 days absence from work, and the severe bruising of a third employee's right arm and side, from which he recovered after 18½ days absence from work.

A picture of a tank similar to the one that exploded is shown in Fig. 1. This is an ordinary commercial 10-gal. galvanized steel expansion tank fitted up to be used as an alcohol-measuring tank in the dehydration unit of the propellant powder plant. The hook-up of the tank and dehydrating press is shown in Fig. 2.

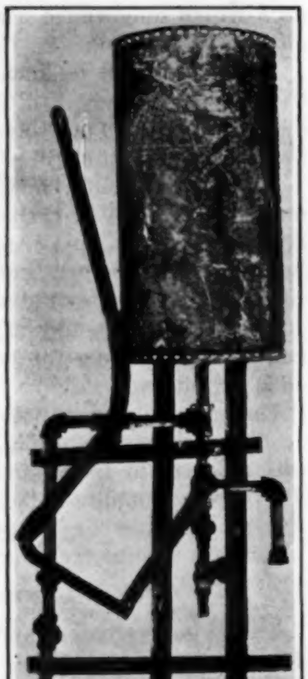


Fig. 1—Duplicate of the Tank That Exploded

On or about Aug. 15, 1922, the tank was moved from the dehydrating house when the latter was torn down to make room for a new unit. The gage glass was accidentally broken and the tank and piping as shown in Fig. 1, with an additional pipe out of the top into which the gage glass fitted, was thrown upon a heap of other used pipes and tanks. On April 25, 1923, workmen took the tank from the heap, unscrewed the fitting from the top and removed all the fittings from the bottom (concave end) except the threaded length of pipe which entered the bottom of the tank. This threaded end was twisted or broken off in the tank. Both ends of the tank as well as the hole for the bottom connection of the gage glass had been open from Aug. 15, 1922, a period of 8 months.

The tank was removed in this condition to the experimental propellant area. A sketch of the tank at this time is shown in Fig. 3. The tank was vigorously shaken and appeared to be empty. However, upon turning on end, a very small quantity of a fine white powder fell out. The tank was then placed on its side, bottom end front, on a platform outside of and to the left of building 39. Three workmen—namely, Franklin, Goldsworthy and Ozswart—then took charge of the tank with a view to converting it to local needs. Ozswart stood on the ground very close to the right side of the tank and attempted to hold it securely between his right arm and side. Franklin stood on the ground 6 ft. in front of the platform with his eyes on a level with the hole in the bottom of the tank directing the work. Goldsworthy stood on the left of the tank and attempted

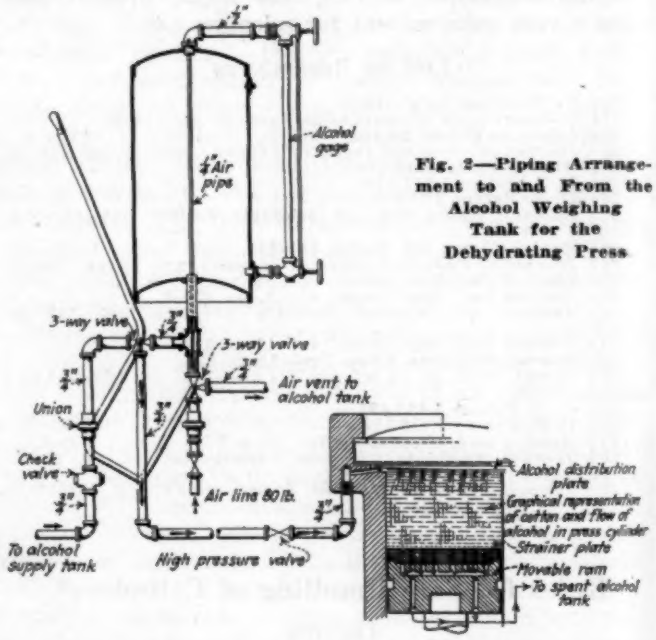


Fig. 2—Piping Arrangement to and From the Alcohol Weighing Tank for the Dehydrating Press

to remove the short piece of pipe from the threads of the bottom pad of the tank by means of a chisel. He held the chisel in his left hand and struck the chisel with a hammer held in his right hand. Upon the third or fourth blow the tank exploded. The position of the tank and principals at the time of the explosion are shown in Fig. 4.

Force of the Explosion

Franklin, who was standing 6 ft. from the tank facing the bottom hole, was knocked down and had his eyes and upper part of his face burned. He immediately called for oil, which he dashed into his eyes and face. Upon examination later, his eyelids were found to be burned and to contain fine particles of foreign material, indicating that he had closed his eyes upon seeing the flash.

Goldsworthy was thrown 4 or 5 ft. and his left hand, which held the chisel, and his forearm up to and including his elbow was badly shattered.

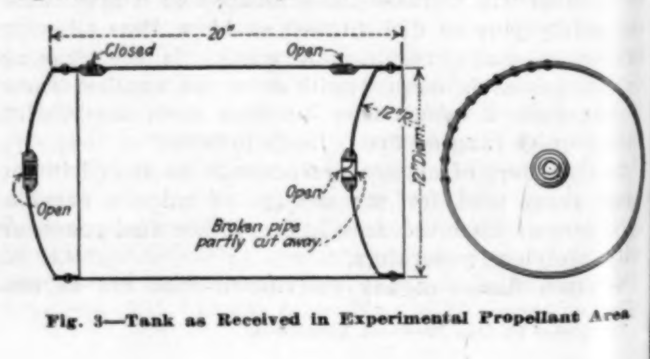


Fig. 3—Tank as Received in Experimental Propellant Area

This paper is published with the approval of the Chief of Ordnance, U. S. A.

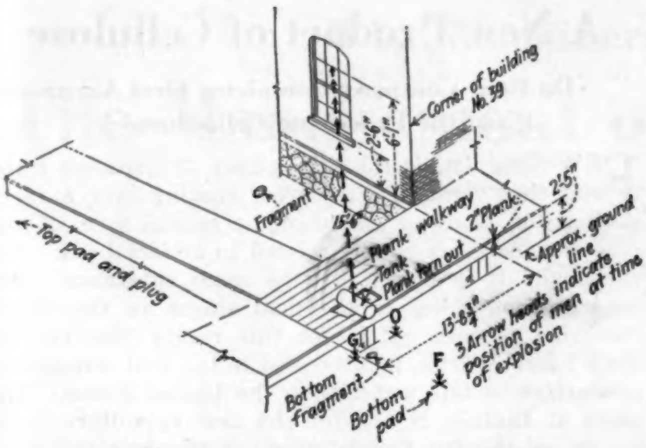


Fig. 4—Layout of the Scene of the Explosion

Ozswart was thrown 5 ft. and his right arm and side were badly bruised. The remains of the tank and the hole in the platform are shown in Fig. 5. The hole was approximately 2x4 ft. The platform was constructed of 2-in. lumber. A 3-ft. section was broken from a 6-ft. 4-in. x 4-in. cross floor beam.

The bottom of the tank is shown on the right. This was originally concave and the force of the explosion forced the concave into a convex form. The pads were blown from the top and bottom openings and a pipe plug in the side wall was blown out. The bottom fragment of the tank dropped directly in front of the tank, while the remaining and much larger fragment was propelled approximately 15 ft., where it struck a window of building 39, knocking the metal sash out of the frame. This is shown in Figs. 4 and 6.

Fig. 5 does not show the tank in proper relation to the platform. The bottom of the photograph shows the rear of the platform. The proper relation of tank and platform is shown in Fig. 4, while Fig. 5 shows the top pad at the rear right. The bottom pad was placed in the bottom of the tank. The fitting at the rear left has nothing to do with the case.

It must again be emphasized that both ends of the tank were open in addition to an opening in the side. The tank shown in Fig. 1 had likewise been stored in the open for the same length of time as the one that failed. Likewise all during this open storage there were three openings in the tank. In spite of these facts,

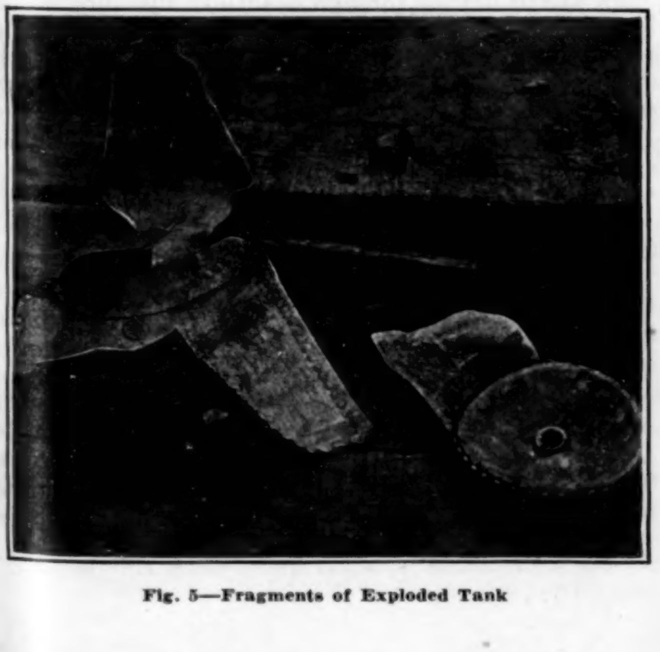


Fig. 5—Fragments of Exploded Tank

there was a decided odor of alcohol at any one of the openings. The odor of alcohol and the manner in which the bottom was blown from the tank give rise to the theory of a gas explosion.

It has been stated previously that Franklin shook a very small amount of fine white powder from the tank. A witness reported that a cloud of light brown smoke occurred at the time of the explosion. Ozswart stated that he got a distinct odor of burned smokeless powder. The duplicate tank and rigging were examined and found to contain an appreciable quantity of nitrocellulose. These incidents give rise to the theory of a nitrocellulose explosion or detonation.

The question arises of how nitrocellulose could have got into the tank. In the dehydrating process, the water carried by the nitrocellulose is replaced by alcohol. The equipment shown in Fig. 2 is used for dehydrating. By pulling down on the lever, the three-

Fig. 6—Damage Done to Building 15 Ft. Distant

way valve on the left is opened, allowing alcohol to enter the tank, and the three-way valve on the right is set to allow air from the tank to escape. The alcohol enters the tank from the large pipe in the bottom, while the air above the alcohol is forced out of the small pipe. When the tank is filled with alcohol, the lever is pushed up to the position shown in Fig. 2. Then the valve on the left is set to deliver alcohol to the press, while at the same time the valve on the right is set to admit air at 80 lb. pressure. Then when the high-pressure valve near the press is opened, air enters the tank at the top and pushes a quantity of alcohol out of the tank into the press. The high-pressure valve is then closed and the ram of the dehydrating press is brought up to bear on the nitrocellulose. The alcohol under proper conditions will flow as indicated on the drawing.

However, if the operator fails to close the high-pressure valve or if the high-pressure valve leaks toward the end of the pressing when the nitrocellulose becomes quite compressed, alcohol may travel back through the high-pressure valve instead of going as indicated on the drawing. The alcohol traveling back through the valve will carry small particles of nitrocellulose with it. This has been proved in several instances. Upon three or four occasions the high-pressure valve became clogged and had to be taken

apart. It was found to be clogged with nitrocellulose. Upon another occasion the line back to and including the three-way valve on the left was taken down and found to be clogged with finely divided nitrocellulose. Hence it seems reasonable to believe that nitrocellulose could have been carried back to the tank from the dehydrating press and could have settled in the concave bottom of the tank. As stated above, the greatest explosive force occurred at the concave bottom of the tank.

The facts as stated above and every phase of the accident were studied thoroughly by a board of officers, that came to the conclusion that a spark caused by friction between the steel chisel and the pipe end communicated with finely divided nitrocellulose in the tank, causing detonation of the same.

To Determine Relation of Low-Pressure Boilers to Smoke Nuisance

An effort is being made by the Mellon Institute of Industrial Research to determine the relation of low-pressure boilers to the problem of air pollution. Incidentally it is hoped to indicate more closely what factors are most important in the design and control of such boilers.

H. B. Miller, chief of the Pittsburgh bureau of smoke regulation and also connected with the Institute, after a number of conferences with boiler manufacturers, is asking each one to furnish the following information for each type and size made:

(*a*) Total equivalent evaporation per hour in pounds of clean water, from and at 212 deg. F., at the nozzle, 97 per cent dry.

(*b*) Grate area in square feet used to obtain this evaporation. If upper and lower grates are used, each is to be stated separately.

(*c*) Total coal required, in pounds per hour, to obtain evaporation in (*a*), with grates (*b*), with such attention to boiler and fire as may be necessary.

(*d*) Draft, in inches of water at the outer edge of the smoke collar, necessary to obtain evaporation in (*a*), with grates (*b*), with coal consumption (*c*). The effective area of smoke pipe and chimney to be at least equal to the area of the smoke collar on the boiler.

Tests are to be made in accordance with the code for testing boilers as issued by the American Society of Heating and Ventilating Engineers, except that all data are to be furnished for bituminous coal of 13,000 B.t.u. value, with volatile content between 30 and 40 per cent for bituminous coal-burning boilers, offered for use under the provisions of the Pittsburgh anti-smoke ordinance.

When this information is received, it will be tabulated and published by the Institute for information of engineers, contractors and prospective users of low-pressure boilers. Proper factors will be included for extreme weather and other varying conditions. It is expected, also, to include simple formulas for the determination of the amount of heat required for a building under stated conditions, or the amount of direct radiation that can be figured in terms of the boiler capacity required and the size of the chimney necessary. Tests probably will be made with other types of coal and proper conversion tables prepared, so that the standard may be adopted for any section of the country.

A New Product of Cellulose

Du Pont Company Completes First American Plant for Producing Cellophane

FEW recognize, in the thin, glassy, transparent material that forms a waterproof coating over a fancy package of candy or perfumery, a special form of viscose and therefore closely related to artificial silk. Yet chemically it is identically the same substance. The only difference lies in the final stages in the manufacturing process. It is for this reason that the Du Pont Fibre Silk Co. is interested in the first commercial production of this material in the United States. The plant at Buffalo, N. Y., for the new subsidiary to be known as the Du Pont Cellophane Co. has just been completed. Manufacturing operations are expected to begin in the near future.

How Cellophane Is Made

The first cellophane was made in 1903 at Taon-les-Vosges, France, by a chemist named E. Brandenberger. Since that time practically all of the material has been made by the French cellophane industry. James Piana, technical director of the Du Pont Cellophane Co., recently described the methods to be used in the manufacture of this commodity in this country.

Extracts from his article in the *Du Pont Magazine* follow:

The raw material used is pure wood pulp, first treated with caustic soda, then with carbon bisulphide. The product thus obtained (viscose) is completely soluble in water and is an absolutely transparent fluid that can be compared to collodion. Viscose coagulates or solidifies very rapidly when brought into contact with certain salts or acids, just as does the white of an egg when put into boiling water; it can be used without distinction for the manufacture of either artificial silk or cellophane. It is only in the method of their fabrication that these two products differ. When artificial silk is made, the viscose is forced through the spinneret, which is a nozzle having a number of minute holes. The filaments obtained are solidified as they pass through a coagulation bath. The reunion of the filaments constitutes a silk thread.

In making cellophane, the viscose passes into a manifold and is forced through a slit-like aperture into a coagulation bath, where it solidifies in the form of a sheet. Then it is treated to eliminate all foreign matter. Washing and drying complete the process and the final transparent product is a sheet approximately 35 to 38 in. wide, from 0.001 to 0.005 in. thick, and of indeterminate length.

Uses for the Product

The fact that cellophane may be dyed, embossed, printed and fabricated in a great many ways indicates the wide range of its possible uses. The best known use, of course, is for packaging. Since the material may be dyed and embossed to look like various fabrics, it has an important use in the millinery industry. Of more interest to the chemical engineer, perhaps, is the fact that as this material is waterproof and can be made of any thickness, it offers possibilities for producing containers, boxes, etc., that are very strong and at the same time resistant to many liquids.

What Machinery Is Necessary for

The Management of Industrial Research

An Accounting System for a Development Department and a Convincing Argument for Its Use

By J. M. Weiss and C. R. Downs
Consulting Chemical Engineers, New York City

The three articles under this title (of which this is the third) consist of excerpts by the Editors from three chapters of a book that is soon to be published entitled "Development Organization." Messrs. Weiss and Downs have handled the subject in a distinguished manner and have rendered a great service to the technical man. They have discussed with frankness and understanding the many perplexing phases of the technical man's relationship to the organization. It is a book that will have a strong appeal to every executive.

THIS article deals with the financial side, the expenses and credits, of research and development work. In commercial undertakings everything must pay for itself in one way or another. Something more than mere self-support is to be expected from research and development work. Any other result reflects upon the ability of its personnel and direction. Those corporation executives who consider that research and development are profitable activities very often base such an assumption on a foundation not supported by exact accounting data. These same men are quite universally insistent that the manufacturing department shall yield products meeting the required standard; that the sales department shall deliver a high standard of salesmanship and at as low a cost as is possible. At the end of any accounting period, say the fiscal year, the cost of producing and the cost of selling can be determined. This allows comparison from year to year, and a study of these figures shows weakness or strength, ability or lack of it. In these two examples, as well as in the cases of other departments, such as purchasing, the results are largely immediate in the current year. In research and development work, however, a different method of evaluating ability, and hence profits, is required, as the latter can ordinarily be returned only at some future time. This delay in the return of profits, which requires a somewhat unusual accounting procedure, often results in neglecting to determine them with the necessary accuracy. The result is that, although the executives may be satisfied that research and development are profitable activities, there is no actual accounted proof of that fixed impression.

In this chapter are presented the principles of a workable method of accounting for research and development work. In this, one must not only record the cost of operations in the research department but must also carry the accounting on through the erection and operation, or alteration and operation, of the manufacturing plant, to determine the total cost. When the process is in successful operation, a portion of its net profits should be credited to research and development.

All of this is discussed in detail later, but what the research man should take to heart is this: He may find at some future time that, although he has kept a careful record of what he has spent, there is no readily available record of the profits made from research work. Let him not feel secure under the favorable attitude of his present employers, but insist that the record be kept. Research is profitable and industrial research men are willing and anxious to back their belief in success, even though it be delayed, by being accounted as rigidly as are the other individual members of the business world.

The research and development department must show that it is a financially going concern, but here there is a complicated problem for solution. The value of the work of a routine laboratory by contrast is immediately apparent, but the culmination of research and development is ordinarily a future goal. The organization of the former comprises ordinarily the less creative and more common type of workers and can be expanded and contracted in step with the variations in the current business cycle, whereas in the latter case many of the investigations must go on irrespective of this cycle, as the financial return is in the future. For this reason the development laboratory should have a yearly budget with the proper balance of expenditures and expected returns, and the budget should correspond with the development policy of the company rather than with the current business cycle.

Too often the accounting of a research and development laboratory is merely a summary of total expenditures largely kept for tax purposes, and the development appears in reports only as an expense and is prominently evident as something that may be conveniently cut off when the first call for economy in operations is made.

To represent properly what is being done, the work of a development laboratory must be subjected to a cost system that will represent with reasonable accuracy the cost of various problems or undertakings and then, in some other way, the value of past work and the present or future value of current work be set up against this in an intelligent fashion.

The executive head of development must convince shrewd and calculating business executives and boards

of directors that the money expended will bring real financial returns, or at least that the chances are such that, based on past experience, the proposition possesses definite speculative possibilities that overbalance the risk. A properly functioning cost system showing a successful development history gives the development head the ammunition he needs, both for estimating his probable expenditures and for predicting the possibilities of return if the development proves successful. At the beginning of a development department such a record within the company does not exist and the recourse is to a study of the record of development in other companies, where such is available, or, finally, to place complete reliance upon the ability of the man selected to supervise the enterprise. At this stage the director must not be overoptimistic, but should feel his way carefully, establishing a foundation of experience and confidence and collecting about him the nucleus of a staff upon which he can build, before extending too far. Let him realize that many development departments have been created over night and few such have been successful. Even the yearly increases in the work and personnel should be watched with great care to avoid too rapid a growth with consequent frailty of structure. It is doubtless a fact of universal application that every industrial research department can greatly increase its effectiveness with no increase in its yearly expenditures by the proper study of its personnel. Often there is much useless effort. In some cases a smaller force of more competent men could be maintained, and with the same total salary expenditure the net results would be much greater. The personnel and output of his staff are directly up to the director of development.

Costs Are Records of Accomplishment

He must, however, realize at the beginning that his future possibilities are predicated on the manner in which his present results are evaluated. He should, therefore, see that the present records are kept so that a future evaluation will be possible in such a way as to give a true picture. A record of accomplishment, at a reasonable cost, inspires confidence in his prediction of success for proposed investigations. This is the function of a cost system and it should be regarded by the chemist as a real aid and assistance.

Department Finances—The modus operandi of the developmental finances will first be considered. There are several ways to handle this, but the two following are most important:

1. Where each job is an entity in itself and where its support must be provided by special financial arrangements.

2. Where a yearly departmental budget is approved, within which the development executive must restrict his expenditures.

Operation under the first scheme presupposes that the department is equipped with the proper buildings and housing accessories to carry on the work; that it is also provided with employees for supervision of the work, for upkeep of the fixed plant and for clerical services; that a yearly appropriation is made for the above and also for charges such as rent, depreciation, insurance, water, gas, light, etc. With these available, each new investigation must be budgeted in detail to estimate the time required for completion; the number and salary rating of workers; the apparatus and materials required and the value of the salable products, if any are produced, which may be credited to the cost of the problem. This method is practiced in a few laboratories and it has many obvious weak points that make it difficult to operate, especially when pioneer research is attempted. It is difficult in this type of laboratory work to predict the time required to solve a problem; supplies and apparatus requirements can seldom be anticipated. The cost very often runs under as well as over and the tendency is to equalize the losses and gains by favoring the problems that will probably exceed their appropriations. Finally, if an essential problem is unfinished at the end of its appropriation, the development executive is usually allowed an extension. Such a procedure is inapplicable to laboratory work because of its complexity, and any advantages of this method are doubtful. Moreover, it shifts the burden of responsibility from the development executive to the executives of the company who approve expenditures. With the yearly budget system for general laboratory work, the development executive knows exactly what he is allowed to spend for the year on all the problems and he can then so allocate the necessary expense as to get the most good out of the laboratory work.

Budget Accuracy

Operating under the yearly budget system, the development head knows very closely from experience the general operating overhead of the department for the coming year. He lays out the probable extent of the research activities based upon previous experience and the general trend of research policy. He includes in the report the major problems that are projected for investigation during the coming year and any large, unusual and expensive apparatus that will be needed for those problems. If the total amount requested is disallowed, the research committee must designate what problems must be restricted in scope or discontinued entirely. When the budget is allowed, the development head must keep within its limits and obtain the greatest good therefrom. This puts the responsibility of the performance of the department squarely where it belongs. If, during the year, members of the research committee feel that their pet problems are slighted, a compromise must be reached. If, however, their demands are obviously greater than their share, it is patently up to them to recommend and put through extensions in the budget for their particular needs.

It is certain that the yearly budget system is workable and more desirable than the individual appropriation scheme for general investigational work. There is, however, one phase of development work that is not amenable to this treatment. In the construction and operation of semi-works plants, it is almost impossible to foretell what the general expenditures will be for the coming year with a degree of accuracy approaching that possible for laboratory work. Such construction normally requires engineering layout and estimates before the cost can be even approximated, and these are not ordinarily available when the yearly budget is made up. Moreover, such work requires relatively large amounts of money for operation, such as for labor, material, power, heat, etc., which are likely far to exceed the ordinary laboratory expenditures. In such cases the special appropriation system is most suitable.

The conclusion is that a combination of these systems is the desirable arrangement—namely, that the general laboratory development work be handled by a

yearly budget system and that the semi-works operations, the expenses of which cannot be exactly predetermined, be taken care of by special appropriations. As to the latter, the director of development should accompany his yearly budget by a note of the probable semi-works projects for which he expects to request authorization, together with an approximate estimate of the amount of these probable extra expenditures. As will be seen later, at the time definite requests are made he must be able to justify the expenditures by certain specific data that will indicate the real commercial possibilities of the project, wherever this can be done.

Experimental manufacture is justified if several criteria are met:

1. A possible market of certain size must already exist or be capable of development for the product at a certain price.

2. The laboratory work must indicate that a sufficient yield of proper quality can be obtained so as to give a material cost that, with other expenses as they would be on the full scale, form a total sufficiently below the estimated sales price to afford a satisfactory margin for sales expense and profit. There is an exception to this rule—namely, where a "full line" is needed. In that case an individual product may be sold at a loss but carried by the profits on the rest of the "line." Any appropriation for such experimental manufacture, therefore, must be supported by data indicating that these criteria are satisfactorily satisfied.

Sales Approval—The first can be taken care of by a formal statement from the sales department that it has looked into the matter of the proposed product; that a market exists, or, if the product is novel, that it is its opinion that it can be created; that it estimates the size of this market to be so many units per month or year and that the probable sales price will lie between certain limits. The basis on which the estimate is made should be stated, together with an abstract of any sales investigation work carried out in this connection.

Cost Sheet I.

Experimental manufacture of			....
Total pounds to be manufactured		....	
Period of manufacture		....	
Raw Materials Cost (Per 1,000 Lb.)			
Item	Used Per 1,000 Lb. Product	Unit Cost	Extension
....	....	$	$ ....
....	....	$	$ ....
Total material cost per 1,000 lb.			$ ....
Manufacturing Labor (Per 1,000 Lb.)			....
Manufacturing Expense (Per 1,000 Lb.):			
Heat, light and power		$	
Alterations		....	
Repairs		....	
Chemical control, supervision and service		....	
Manufacturing supplies		....	
Insurance (fire and liability)		....	
Interest on equipment and stock		....	
Charges for facilities used		....	
General expense		....	
Packages		....	
Construction appropriation		....	
Probable salvage value less dismantling cost		....	
Difference		$	
This is equivalent to depreciation and obsolescence per 1,000 lb.		....	
Total manufacturing expense per 1,000 lb.			$ ....
Total cost per 1,000 lb.			$ ....
Net value of byproducts			....
Net cost per 1,000 lb.			$ ....
Total net cost per .... lb			....

Cost Sheet II.

Ultimate cost of large-scale manufacture of..................

Estimate prior to experimental manufacture.

Scale .... lb. per day

Raw Materials Cost (Per 1,000 Lb.).			
Item	Used Per 1,000 Lb. Product	Unit Cost	Extension
....	....	$	$ ....
....	....	$	$ ....
Material cost per 1,000 lb.			$ ....
Manufacturing Labor (Per 1,000 Lb.)			....
Manufacturing Expense (Per 1,000 Lb.).			
Heat, light and power		$	
Repairs		....	
Supervision and control		....	
Supplies		....	
Insurance		....	
Depreciation		....	
Interest		....	
Taxes		....	
General expense		....	
Packages		....	
Manufacturing expense per 1,000 lb.		....	
Total cost per 1,000 lb.			$ ....

Estimated Costs—The second matter is best taken care of by means of two cost sheets, one representing the estimated costs of operation in the semi-works plant, including all the extra supervision, labor, control and wastage of materials incident inevitably to experimental production. This cost will always be above the estimated manufacturing cost. For sake of reference this will be called Cost Sheet I. Cost Sheet II shows the estimated cost in the large-scale manufacturing plant under normal running conditions. Cost Sheet I should contain detailed figures on the basis of 1,000 lb. or other unit of product.

Local accounting practice may make some further subdivisions desirable. Most of the items are self-explanatory. In making up this cost sheet, liberal allowance should be made, under materials, for the losses of yield inevitable in the early stages of experimental operation. Similarly, the estimates for labor should take into account unproductive periods when the plant is shut down for alterations and changes. The cost of such changes, and they almost invariably occur, should be anticipated in the item allowed for alterations. Chemical control and supervision must be ample and will exceed that of a normal manufacturing operation. This is not only true regarding the supervision, labor, etc., per 1,000 lb. (due to the experimental production being on a smaller basis than regular manufacture) but is also true as to the total required for operation of a unit, due to the fact that conditions are not standardized.

The items "interest on equipment and stock" and "charges for facilities used" require some discussion. The former refers to apparatus erected and inventories of operating materials for the particular project that represent tied up capital. The regular rate of interest on these items should be applied to the project. Besides, the problem uses certain permanent facilities, and there should be a yearly percentage charge based on the value of these facilities, representing the average carrying charges on them. That portion of the semi-works buildings and facilities which is not in use also bears carrying charges, and these should go against the idle plant expense account. If this account is not

prorated against laboratory problems, but kept separate, a better picture of the real cost of individual investigations will be obtained.

The calculation of "depreciation and obsolescence" is different from the ordinary method. An experimental plant is erected, run for a period, shut down, dismantled to make room for the next operation and the building restored substantially to its original condition. The difference between the original cost and dismantled value less dismantling cost plus building repairs is chargeable to the experiment. This, of course, does not include the erection cost of permanent buildings or the installation of ordinary service headers, which are rightfully charged to capital account. In figuring the dismantled value of the plant, all that can really be considered as of value are the unit pieces of apparatus, expensive instruments, etc. If these are standard and usable for other processes, their cost less a reasonable depreciation seems a fair way to consider the matter. If special, usually very little more than junk value is proper. Byproducts should be credited at a fair value under the sales price, to allow for selling expense, and it is well to be very conservative on this, unless there is a very broad staple market.

The items of manufacturing expense may be subdivided in various ways, and the extent of this subdivision will vary with different accounting practice. In some cases, on processes parallel to those on which operating experience is available, a factor based on labor to cover all manufacturing expense items may be used to advantage. On lines very different from the past experience of a company, it is better to figure out each item in detail.

With the data of Cost Sheets I and II and a favorable report on sales in hand, the construction and operating appropriation can be properly supported and justified.

Appropriations—These appropriations may be made up in some such general form as the accompanying, which represents a summary only.

To this sheet are appended detailed engineering estimates supporting each item of construction cost.

It is not usual to have to incur capital expenditures for new buildings for semi-works projects, and it may be that these should have special forms, depending on the general routine of accounting matters. Normally, a properly equipped development department may be assumed to have suitable buildings available. However, alterations to buildings usually fall into one of two classes—one where a permanent value is added, and the other made for the exigencies of the experiment. The former belong in the capital account, the latter in expense. Temporary sheds, as well as special sewers, headers or feeders needed for a particular operation and not generally applicable in later work also should be considered as expense items. Experience has shown that a fixed practice of this kind is necessary, otherwise at the end of a 5- or 10-year period, where experimental installations are charged sometimes to capital and sometimes to expense, where retirements are made, etc., it is most difficult if not impossible to tell what has really been spent on the development of a project. In the cases where a semi-works plant continues to run after the experimental period, as a fixed manufacturing operation, a transfer may be made at a fair value from expense to capital account. In this way it is certain that the capital account is not burdened with unproductive assets really belonging to development expense.

Regarding "apparatus and material purchases" sometimes these represent items on hand in stores or stock which do not have to be purchased. In such cases note should be made that a certain amount of the total represents a transfer and not actual cash expenditure, so that a true picture of the financial requirements can be obtained. The form, if necessary, can provide space for such information.

Because of the lack of space the section of the book describing the details of the cost system is omitted.

The Returns of Development

The majority of the work of a research and development department, unlike that of a routine laboratory, cannot be allocated to any branch of the business, but must be regarded as work for the future of the company as a whole. Naturally, a research laboratory often devotes a part of its time in referee testing for other branches of the company. Two plants of the company may have a dispute regarding interplant shipments, which cannot be settled between them. The sales department may desire information on the quality of certain competitive products; the purchasing department, data concerning new raw materials, etc. Such work should be charged at a fair rate directly to the department making the request and credited to the research and development department. Otherwise unexpected demands of this type may embarrass the budget.

Appropriation for Semi-works Manufacture
For Manufacture of ....

Capital Account	Estimate		Actual Cost of Erection (To be filled in when appropriation is closed)	
Land	$		$	
Permanent buildings	....		....	
Service headers, sewers, etc	....		....	
Alterations resulting in permanent improvements	....		....	
Total to capital account		$		$ ....
Expense Account				
Alterations to existing buildings which do not increase value	$		$	
Construction of temporary buildings	....		....	
Unusual feeders, sewers, etc	....		....	
Apparatus purchases	....		....	
Material purchases	....		....	
Labor for erection	....		....	
Supervision of erection	....		....	
Design expense	....		....	
General expense	....		....	
Contingencies	....		....	
Total to expense account		$		$ ....
Total construction cost		$		$ ....
Total operating cost as per Cost Sheet I		$		$ ....
Gross total cost of experiment		$		$ ....
Estimated sales value of product		....		....
Net total cost of experiment		$		$ ....
Credit for capital account		....		....
Net cost chargeable to experiment		$		$ ....

As to the work in new fields, this must pay or it has no place in a going business. This does not mean it must pay from the start—that is almost impossible. Some projects do not give returns for 5 years or more and in the initial stages of a research and development

department it is unreasonable to expect dividends. If, however, the work is handled with judgment, not only in its prosecution but also in the selection of problems, research and development pay well after the initial incubation period.

From what has been said heretofore it might be concluded that problems that do not show industrial application do not belong among the activities of industrial research and development organizations. Even an approximate prediction of the cost of such pioneer work can seldom be made, and consequently only the strongest industrial organizations can undertake them with safety. Many of the great technical accomplishments were undertaken with no immediate prospect of return, and it is safe to assume that had the total cost of development been visualized at the outset, the problem would have been tabled indefinitely. Once having started the investigation and having expended large sums, it became necessary to capitalize on the progress so far obtained, by continuing the work. As stated above, only financially strong organizations can carry such a load and it is fortunate that such strength exists, combined with the vision and faith of their directing executives.

Numerous examples of this sort exist. With a young research and development department or with a smaller company, such ambitious programs either should not or cannot be undertaken and a very careful selection of problems of smaller but important scope may be made. With success upon these, a more ambitious program may be considered later.

Some method must be used to evaluate the results of past work in the terms of present returns so as to show this value and encourage extensions. To reduce this to a basis on which an estimate can be made, a company that does no research or development may be imagined. There are no process improvements or new products coming from the inside. All of these must come from an outside inventor and the company must pay for them. Why not apply the same methods of payment to the inventing and developing force on the inside? The majority of developments fall into three classes:

1. Improvement of an existing process:
   (*a*) Cost.
   (*b*) Quality of product.
2. New uses for existing products.
3. Development of a new manufacture:
   (*a*) Process for old product.
   (*b*) Process for new product, including markets for the product.

In the first class the development may or may not be patentable. If it involves a cost reduction, this is certainly ascertainable. Just as in the case of an outside inventor, the amount due the development department depends on the capital investment necessary to effect the saving. Although each case requires somewhat different treatment, some general limits may be suggested that appear fair. If the improvement is patentable, a payment for the life of the patent should be made, and this may take the form of a percentage of the saving, somewhere between 25 and 40 per cent, the amount varying inversely with the capital required to make the saving effective. If the improvement is not patentable, the period of royalty should be from 3 to 6 years only, the percentage being figured at about two-thirds of that which would have been allotted had the improvement been patentable.

On improvements of quality, the question is more difficult of evaluation. Such an improvement, however, if commercial, should give either a higher sales value to the product or a greater sales volume at the same price. This value, however, can be estimated by the same department with at least an approximate degree of accuracy and a fair share allotted on the special books of research and development. The improvement in quality may be made on an intermediate product that is not sold. This, however, will either lower the cost or improve the quality of the salable finished product and may, therefore, be evaluated on the pertinent basis.

> "Do not pin your faith to the favorable opinion of superior officers. Justify the expenditures of your department with convincing evidence based on accurate costs."
>
> That is the purport of the message that this article carries to the research executives of the country. It is sound common sense, but how many executives do more than distribute the expenditures, with the result that their departments appear only as a great big debit? Perhaps this may serve as a word to the wise.

Wherever new uses can be developed for existing products, even though these uses enter manufacturing outside the proper producing activities of the company, the development department should be concerned. Selected uses of this kind, if disposed of to interested manufacturers, increase the business of the company through greater sales. The increase in sales from such a cause is directly creditable to the research and development department on an equitable basis.

In matters involving the development of a radically new process, almost without exception, a valid patent can be obtained. Further, a considerable investment is always required to carry out the results of the development on a commercial scale. Here, if the product is new, a royalty on gross profit seems to be the fair system. The percentage may vary from 5 per cent as a minimum to 25 per cent as a maximum, depending, as before, on the capital investment required and also on the spread between cost and selling prices, the sales effort required to create a market and similar factors. No two cases will be alike and all conditions must be considered in determining the royalty that should run for the life of the patent. If the product is an old one, the royalty should be based on the saving in cost over the best old process, in general, being credited in a similar way to an improvement in an existing process.

Sometimes the foreign rights to these patents are valuable enough to form the subject of a sale or license by the company. Here it is felt that the research and development should receive 50 per cent of the net proceeds from such sale or license.

Where new products or machinery are developed that extend the uses of staple products of the company, the manufacture of which, however, would force the company into strange fields, it is wise to form subsidiary companies to supply the market. This results in the sale of processes and, whether patented or not, a fair proportion of their estimated value should be credited to the research department of the parent company.

In all this discussion of payments it should be clearly

understood that these may be actual credits on the books of the company, or, if this for tax or other accounting reason seems undesirable, they may be made in a set of books kept solely to show the returns from research and development work. With a development department of the right type and with enlightened administration, these books will soon show the department out of "red ink." After a period of years, the research and development department will be shown in its true light, one of the most profitable departments of the entire business. The past costs of each project are known at every stage, the results are shown and the resistance to new ventures is lowered. There always are some blunders, but with wise management these are recognized in the early stages and rectified before the expense is too great.

In industry there are many striking examples of development departments of small and large companies that have reached the stage of real profit. The executives of these companies realize that research and development pay and are good business. It is doubtful, however, if many of them have had this expressed in dollars and cents. Such expression would reveal a much greater measure of value and show that every dollar sown in the field in the past was returned with interest; that the running expenses of today were paid by the profits of past effort and that above all these requirements there remained a handsome surplus. In addition to such tangible assets, there are intangible but nevertheless valuable assets, created by a broad policy of research and development. Leadership in the field, prestige born of progressiveness, patents and good will, all have a considerable worth to any company. If the records are properly kept, the tangible results are apparent and the value of some of the intangibles, such as an accurate estimate of the worth of patents and trade secrets, may be arrived at with exactitude. Such an accurate evaluation would be of great value, but doubtless few corporations possess records whereby this can be accomplished. With such knowledge, broader development can be planned and justified.

The value of intelligent advertising is not questioned by our progressive business men. Based on their past experience, they approve annual appropriations for this purpose, an outlay for a product of a million dollars or more in a year not being unusual. The returns from advertising are realizable within a short time after the money is spent, but by the same token vanish when the expenditures are discontinued. A mediocre product can be sold by large continuous expenditure for advertising; after reduction of such, only the product with intrinsic merit holds a market. Money expended in research and development will not give the immediate returns comparable to advertising, but its effect is cumulative and the ultimate results are unquestionably greater.

Each method of business expansion is admittedly a gamble, but research is creative.

Our remarks are directed to a product that is basic and not the child of fad; to the executive that builds and not to the speculator that aims at a quick turn; to the man that aspires to future recognition in industrial history and to the consuming public that gains nothing from and even loses by the vast majority of advertising expenditures. Advertising efficacy will reach a limit in a relatively inconsequential time. Research will endure until every product is at its ultimate perfection and is produced at an irreducible cost—in short, until there is nothing left to be discovered.

Rapid Annealing of Cast Iron

Bureau of Standards Comments on Schaap Method of Producing Easy Machinability

The Schaap method of annealing gray cast iron recently described by Stoughton has been tried out at the Bureau of Standards on small samples, in a preliminary way, and in regard to microstructure only. A microstructure similar to that of the Schaap iron was obtained without the use of the wrought-iron muffle on which the published descriptions of the Schaap process lay so much stress.

Specimens of stove plate were held at 760 deg. C. for 15 minutes in an electric furnace in air. A similar anneal at 820 deg. C. gave similar metallographic results. The analyses of the unannealed specimens were as follows:

	M_1	M_7
Total C	3.55	3.42
Graphitic C	2.95	2.81
Combined C	.60	.61
Si	2.31	2.30
Mn	.51	.47
P	.72	.70
S	.07	.11

The pearlitic cementite of the particular gray iron used is almost completely graphitized by the short anneal, so that the specimen shows practically free graphite in a matrix of ferrite. Etching is required to show this, as unetched specimens could scarcely be distinguished from the unannealed material. Such a microstructure is, of course, consistent with the claims made for machinability and for a small degree of ductility, but the specimens annealed at the Bureau of Standards and the Schaap specimens with which they were compared were all too small for mechanical testing.

The Bureau of Standards points out that, however valuable the Schaap iron may prove on the score of machinability or for special and specific uses where the very limited degree of ductility and toughness apparently developed by the short-time anneal may be useful, the product is still, from the point of view of a material of construction, in the cast-iron class. That is, it is still an essentially brittle material as contrasted with truly tough and ductile alloys.

The question is also raised whether, after a "Schaap anneal," the mechanical and machining properties might not be largely determined by the phosphorus content, since the Steadite does not appear to be affected by the anneal.

Chemical Section at British Exhibition Nearing Completion

According to the *Chemical Age*, London, very good progress is being made in the chemical section of the British Empire Exhibition at Wembley. This occupies nearly 30,000 sq.ft. in the northeast corner of the Palace of Industry, which in itself has been complete, except for internal arrangements, since last November. In the case of the chemical section these internal arrangements consist in the partition wall surrounding the whole section, the internal partition separating the scientific section, and the structures of the individual stands. The partition walls are now practically complete, and several of the stands are already taking shape.

Legal Notes

By Wellington Gustin
Of the Chicago Bar

Combination Patent Should Be Definite

In Patent on Rust Remover Involving Combination of Three Older Elements, Only Materials Specifically Mentioned Are Considered as Affecting Infringement

In a suit by the Polygon Products Corporation brought against the Kant-Rust Products Corporation and others, the U. S. District Court found the patent of plaintiff had not been infringed and dismissed the suit. The patent in suit was Abbott patent No. 1,333,363, involving claims 2, 3, 5 and 6, for a compound for penetrating interior corrosion. (291 Federal 702.)

According to the specification, the invention was adapted to penetrate minute interstices for the loosening of rust or other corrosive adhesion in such location, as, for example, to clean the threads of a nut and bolt, or in any other place where a part to be removed is held against normal free movement. The complete invention consists of a penetrating agent, capable of disintegrating rust or other corrosion; a penetrating lubricant, and a colloid to be carried in by the thin body of the penetrant in combination with the lubricant. Old elements are used—nothing new in the way of a penetrant, colloid or lubricant being created.

As to the penetrant, no particular kind is recommended. The specification, after naming nine different penetrants which "may" be used, adds "or similar hydrocarbons of low viscosity." No particular colloid is provided, for the undisputed evidence is that every substance is a colloid, or colloidally soluble. However, it is stated that the colloid should "preferably contain coumarone resin, polymerized olefins or polymerized unsaturated fatty oil." As to the lubricant, it is provided that it "may comprise higher aliphatic or naphthenic hydrocarbons or vegetable or animal oils."

The court says that if dissolving rust can be accomplished only by using a penetrant, a colloid and a lubricant, then this patent at its face value would prohibit all persons from accomplishing that by using any materials which might possess those three characteristics. But this struck the court as being too sweeping. Patents, and particularly combination patents, providing for the use of well-known elements should be more definite and certain than this.

The court says there can be no infringement of a combination patent unless all of the elements claimed in the combination are made use of. If a different combination is used, the rights of the patented combination are not interfered with.

Defendants' lubricant "Kant-Rust," composed of artificial graphite, petroleum oil, coal-tar oil and animal fat, was charged with infringing the Abbott patent. Kant-Rust was designed for and is chiefly used for the lubrication of automobile springs, but it could be and probably is used for dissolving interior corrosion. Now the court says that if the terms of the patent in suit should be construed to cover every combination under the sun that may consist of the three elements as named above, then the defendants' product infringes.

Because of its being so vague and indefinite the court thought the patent invalid, but found it unnecessary so to hold in disposing of this case. By limiting the patent to the materials specifically mentioned therein, in order to avoid a holding of invalidity, the court said it was then a matter of determining whether the defendants have used those particular materials. Defendants' article Kant-Rust possesses a penetrant, a colloid and a lubricant; but their colloid is not that mentioned by the patentee, to wit, coumarone resin, polymerized olefins or polymerized unsaturated fatty oil. The defendants not using the colloid which the patent, as limited, called for, there was no infringement.

Suggestions to Inventors Become Theirs

Suit on Riley Patent for Underfeed Stoker Emphasizes Right of Inventor to Adopt Suggestions Made While Invention Is Being Reduced to Practice

The Riley patent, No. 1,152,222, claims 3, 9 and 10 for an improvement in the Taylor underfeed stokers, whereby a larger quantity of fuel could be fed and consumed without clogging the device or wasting the fuel, was held valid and infringed by the Circuit Court of Appeals of the United States in a suit brought by the Sanford Riley Stoker Co. against the Frederick Iron & Steel Co. and another. (287 Federal 495.)

In this case the court says that an inventor who is working to reduce his idea to practice may adopt the suggestions made by another without losing his right to a patent therefor, especially where, as in this case, the other took no steps to assert his ownership of the invention, and any rights he might have thereto had been lost by his inaction. It was contended that one James H. Wood, and not Riley, was the actual inventor of the improvement. At a conference when he and Riley were present Wood made suggestions and pencil indications of a proposed construction, though not identical with that finally produced by Riley. But it was not shown that Wood took any of the usual steps to assert his ownership of the invention, but merely contented himself with claims uttered at various times, generally, if not entirely, after the improvement was perfected and put into practical operation. This inaction on his part, long prior to the bringing of the suit on the Riley patent, the court says, annulled any rights he may possibly have had. Besides, the court says that even if Riley made use of any of Wood's suggestions, it would not preclude his right to a patent, citing the following rule:

"In reducing an idea to practice, an inventor has a right to avail himself of the constructive skill and ingenuity of others, and the suggestions which he may derive from them, and the improvements which he may adopt in consequence of these suggestions, belong to the embodiment of his invention and not to its essential character. Hence no notice is taken by the law either of the suggestions or their author."

It was urged that every element in each claim in dispute was found in the illustrations of the prior art. But the court said that even though the elements were all old in the art, the selection and regrouping of these elements, whereby a difficult problem, which others had failed to solve, was finally solved successfully by the inventor, by the exercise of considerable ingenuity, entitle the claims to as liberal a construction as the prior state of the art and their restricted language would permit.

Equipment News

From Maker and User

Radiant Heat Gas Burner

Natural gas is one of the handiest and best of industrial fuels. Until recently, when this fuel grew scarcer and more expensive, it has been burned without regard to its efficient use. Of late years, however, more attention has been paid to its economical use.

One of the interesting burner designs resulting is that made by the Lee B. Mettler Co., Los Angeles, Calif. This burner, called the Mettler surface combustion gas burner, is designed not only to burn the gas as efficiently as may be but also so that the minimum of damage may be done to the refractory lining of the combustion chamber. This burner system has also been designed with a view to the efficient use of oil as a fuel, for oil generally occurs where natural gas is found and is thus the alternate choice when for any reason the normal supply of gas is not available. For this reason the combustion chamber is designed at the start for the use of either oil or gas as fuel and it is claimed that good results can be obtained with either.

Early deterioration of refractories is claimed to be due to the oxidizing effect of a large amount of excess air present during combustion. The burner here described, shown in Fig. 1, is designed so that excess air is reduced to a minimum. The gas pipe in Fig. 1 is shown entering a metal manifold box. From this manifold the gas is projected into each of the burner openings (there being thirty-two of these openings in the example here shown) from four directions and at an angle of 45 deg. toward the combustion chamber. The current of gas thus set up entrains just the correct amount of air to support combustion.

Immediately next to the gas manifold, on the furnace side, is a tile of silicon-carbide refractory. This is of the same area as the manifold and has corresponding holes through it. As the mixture of gas and air enters these holes it is thoroughly mixed because of the swirling motion imparted to the stream by the 45 deg. entrance angle of the gas. This construction and scheme are clearly shown in Fig. 2.

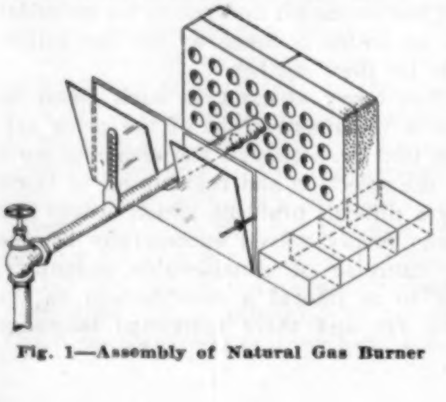
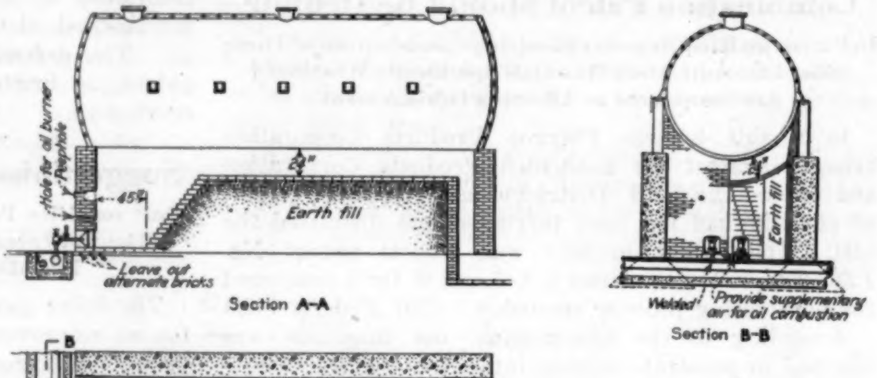


Fig. 1—Assembly of Natural Gas Burner



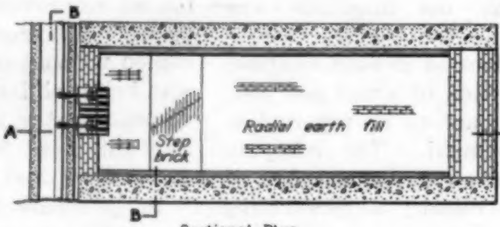


Fig. 3—Typical Application of Natural Gas Burner to a Direct-Fired Still

The gas is lighted at the surface of the silicon-carbide block. This soon becomes incandescent and a surface combustion results. It is claimed that Orsat analyses show that combustion to be complete as close to the burner as 12 in.

Fig. 3 shows a typical still installation with combustion chamber designed for use with either the Mettler burner for gas or any desired oil burner. It is claimed that with this burner and a properly designed combustion chamber the greatest advantage can be taken of radiant heat and the fuel thus can be used in the most efficient manner. The burner has been efficiently applied to high- and low-pressure boilers, kilns, annealing furnaces, melting furnaces, stills, ovens and other types of industrial furnaces. In each case the combustion chamber is properly designed to permit oil and gas both to be used efficiently.

Metal Cutting Torch

An improvement in cutting torches used with the oxy-acetylene apparatus has recently been placed on the market by the Alexander Milburn Co., Baltimore, Md. This is called the "Super Tip." Its makers claim that, while it embodies all the desirable features of preceding standard tips, it has additional features that mark it as a real advance in the design of such equipment.

Among the distinctive features of this tip are a method of mixing the gases, preheating the cutting oxygen and giving added velocity and penetration to the preheating and cutting jets. A further feature is that the tip is provided with a renewable seat at a fraction of the cost of a complete tip, rendering it unnecessary to re-machine or discard the used tips. This renewable seat facilitates the cleaning and maintenance of the tip. In the former standard tip the seat could be refaced by taking a thin cut off it in a high-speed lathe, but it might be some time before such a repair could be made.

In this new tip the mixture of the preheating gases takes place in multiple passages in the renewable seat. These gases then pass into an annular passage, where they are given a swirling motion and an additional mixing. The gases are again separated and expanded into enlarged multiple passages leading to the orifices in the tip proper. Here the preheating flames are projected with an increased velocity inclined toward the high-pressure oxygen jet, resulting in a speedier cut, narrower kerf and a saving in gas.

In tests the following economies have been proved for the new design: in time, 17.5 per cent; in oxygen, 10.9 per cent; in acetylene, 25.0 per cent. This is equal to about 18 per cent of the cost of operation. These tips are interchangeable with all sizes of Milburn equipment manufactured since 1915.

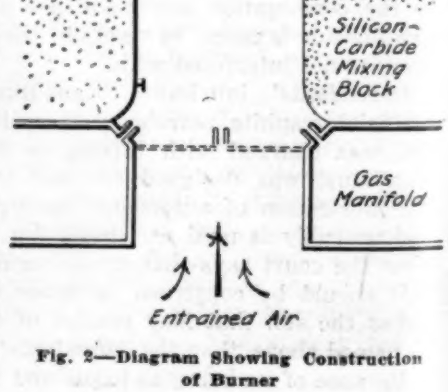


Fig. 2—Diagram Showing Construction of Burner

Steam Flow Meter

An Instrument That Shows Steam Make or Consumption in Boiler-Horsepower

For use in the smaller plants, having only a few hundred boiler-horsepower in steam-raising equipment and also for use in larger plants where there are small units in use, the Republic Flow Meters Co. has placed on the market a small model flow meter called the R.B.

In maintaining efficiency in such plants this meter performs practically the same function as the more elaborate systems which are often impractical in such places. It is essentially a reproduction on a smaller scale of the standard Republic flow meter, type R.S. In general it consists of a graduated dial reading directly in boiler-horsepower, a meter body, installed where desired, and a differential medium, either of the pitot tube or orifice plate variety.

The indicator dial part of the instrument is shown in Fig. 1. The meter body appears in Fig. 2. The meter keeps the fireman informed of each boiler's production. Notice of sudden steam demand is given in time for him to force steam production to meet it. Impending drops in demand are taken care of in a similar way. Thus the meter system shows up both lagging and overloaded boilers and provides a means for effecting fuel economies. It will also be useful for industries using process steam.

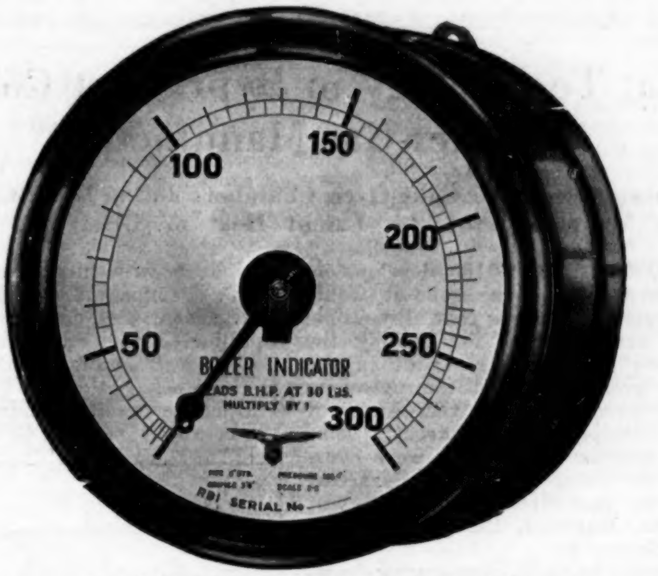


Fig. 1—Indicating Dial of Steam Flow Meter

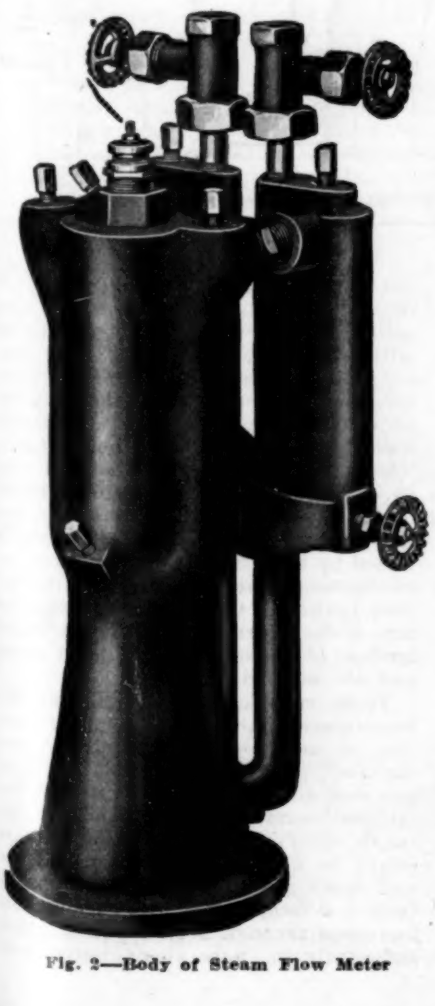


Fig. 2—Body of Steam Flow Meter

Portable Electric Drill

The General Electric Co., Schenectady, N. Y., has recently placed on the market a new portable electric drill. This drill, called the "Speed Way," is made in several sizes. It is provided with a special series-wound motor, built so that the torque varies inversely with the speed, thus making stalling practically impossible, even under severe working conditions. Gears on the drill are made of heat-treated alloy steel and run in grease. The control switch is located under the operator's thumb and is so designed as to avoid arcing.

Corrugated Zinc as a Building Material

The qualities of zinc as a corrosion-resisting material are so well known from the wide use of galvanized iron in industry that its utility as a building material in places exposed to corrosive action are evident to all. Because of this useful quality of the metal, the Illinois Zinc Co. has recently placed it on the market in the form of corrugated zinc sheets of roofing or siding. For the material in this form the company claims several advantages over the familiar galvanized iron corrugated sheet.

In the first place, the zinc sheet is not subjected to corrosive action at the edges and around nail and bolt holes. Then also mechanical abrasion, which in the galvanized product is likely to expose the easily corroded steel or iron, does not harm the zinc sheet. Again, zinc does not need painting, but weathers to a pleasant silver-gray color; while the other types of metallic building sheet must be frequently painted. This one fact alone is claimed to more than make up the original difference in cost between the pure zinc product and the galvanized sheet. In a table following are given the weights and corrugations available in this material:

Approximate Weights Per Square

Gage No.	Corrugations 1¼ in. x ⅜ in.	2½ in. x ⅝ in.	2½ in. x ¾ in.
9	75 Lb.	73 Lb.	79 Lb.
10	84 Lb.	83 Lb.	90 Lb.
11	100 Lb.	102 Lb.	112 Lb.
12		119 Lb.	131 Lb.
13		132 Lb.	149 Lb.
14		146 Lb.	168 Lb.
15		162 Lb.	187 Lb.
16		181 Lb.	200 Lb.

Corrugated zinc sheets are made in standard lengths of 5, 6, 7 and 8 ft. and in standard widths as shown above. Special sizes can be furnished up to 12 ft. in length and in widths as follows:

Maximum widths (1 corrugation lap) No. 12 gage or more, 37 in., covering width 35.

Maximum widths (1½ corrugation lap) No. 12 gage or more, 38¼ in., covering width 35.

Maximum widths (1 corrugation lap) No. 11 gage or less, 38½ in., covering width 36.

Maximum widths (1½ corrugation lap) No. 11 gage or less, 39½ in., covering width 36.

Manufacturers' Latest Publications

The Philip Carey Co., Cincinnati, O.—Bulletin 103. A bulletin giving results of heat transmission tests on commercial heat insulations, as carried out by various impartial investigators.

Bauerle & Morris, Philadelphia, Pa.—A new catalog on various types of water stills made by this company.

Weston Electrical Instrument Co., Newark, N. J.—A folder describing the new Weston line of square switchboard instruments.

American Appraisal Co., Milwaukee, Wis.—A pamphlet entitled "Value," being a reprint of an address given by H. B. Hall before the Central States Group of Security Commissioners at Indianapolis, Ind., Nov. 23, 1922.

American Appraisal Co., Milwaukee, Wis.—A booklet on "Property Records," their effect on profit and loss, by H. B. Hall.

Review of Recent Patents

Heat Technology in Byproduct Coke and Water-Gas Manufacture

Heating System for Coke-Oven Chambers and a Water-Gas Process That Makes Use of the Latent Heat of Blast Gas Described

IN CONSIDERING the development of byproduct coke ovens it would seem logical to assume that all possible simple arrangements for heating the chambers had been tried out in the earlier ovens and that improvements had proceeded along the lines of greater complexity. Apparently some of the simpler possibilities were overlooked, for Julius Becker, of Syracuse, N. Y., has just disclosed one in Patent 1,485,451, March 4, 1924, assigned to Semet-Solvay Co.

Referring to the accompanying drawings, it will be seen that on each side of the coking chamber there are horizontal heating flues. Each set of flues is divided into two parts by a vertical central division wall. Checkerwork regenerators *B*, *B'* are located beneath the outer ends of each oven, while under the central portion are the flues *A*, *A'* running lengthwise of the battery of ovens. These are provided with the usual reversing valve so that they may be connected alternately with the air or with the stack.

Assuming that flue *A* is connected with the air, the operation is as follows: Air from *A* passes through the regenerator *B*, flue *C* and riser *D* to the uppermost flue of the heating system. Here it divides to right and left and passes down through the horizontally baffled passages, gas for combustion being introduced through burners *E*, *E'*. Products of combustion are discharged through passages *F*, *F'* to the sole flue *G*; then through flue *C'* to regenerator *B'* and finally out through *A'* to the stack.

Upon reversal, incoming air follows the course *A'*, *B'*, *C'*, *G*, dividing at *F* and *F'* to pass upward through the heating flues instead of downward as in the first case. Uniform temperature control is claimed as one of the particular advantages of this construction.

Self-Steaming Blue Water Gas

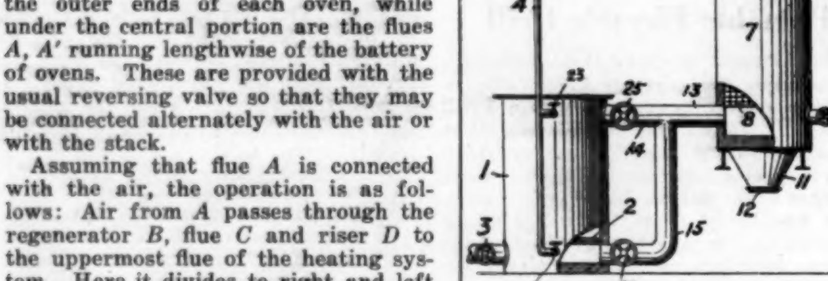
John M. Rusby, of Philadelphia, Pa., has developed a system whereby the heat liberated by the combustion of blast gases in a blue water-gas plant may be used in the waste heat boiler for raising steam. (Patent 482,360; Jan. 29, 1924; assigned to United Gas Improvement Co.) Operation of the plant shown in the accompanying illustration may be outlined as follows:

The fuel-bed in the generator 1 is blasted with air and the blast gases pass by the connections 14 and 13 to the ignition or combustion chamber 7. Here they meet air introduced as by

Blue Water-Gas Plant

the connections 9 and 10 and are ignited and burned. This is the step called the "blow" and it is alternated with steps called the "runs." By reason of the previous practice of the process, the temperature in the ignition or combustion chamber is sufficiently high to insure ignition of the blast gas. The temperature of the blast gas may be quite low, lower than would cause ignition upon the admixture of air, but the temperature of the blast gases is raised by heat stored in the ignition or combustion chamber sufficiently to insure ignition. Obviously the temperature in the boiler is below that at which ignition of the admixture of blast gases and air would take place.

These considerations emphasize the importance of the presence of the ignition or combustion chamber. Again the fact that the admixture of blast gas and air is certainly ignited in the ignition chamber is of importance because otherwise the whole apparatus might be filled with a mixture of air and blast gases unignited because of their low temperature, which might be increased through some cause or other sufficiently to cause an explosive igni-



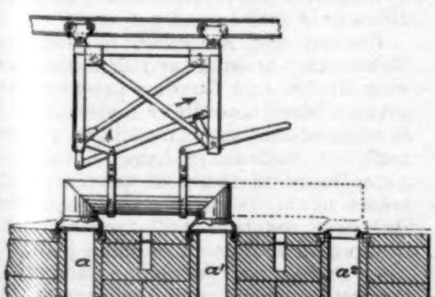
Heating System for Coke Ovens

tion, but all of this is avoided because of the presence of the combustion or ignition chamber. During the run, steam is introduced by manipulating the steam valves 23 and 24 and valves 25 and 26, either upward or downward, through the fuel bed and thus producing water or so-called blue gas, which passes through the combustion or ignition chamber 7, the boiler 6, the connections 17 and 20 through washbox 21, through off-take 22; it being understood that the stack valve 19 and all the air valves are closed. The water gas in passing through the combustion or ignition chamber 7 picks up some of the heat stored in that chamber and applies it to the generation of steam in traversing the boiler 6, so that the application of heat to the boiler is made more uniform than it would be in the absence of the combustion or ignition chamber. The "blows" and "runs" are repeated in alternation, blue or water gas is produced and the steam necessary for its production is supplied from the boiler 6, in which it is generated by the heat of the blast gas and blue gas. As has been said, the application of heat to the boiler is uniform and danger from explosions is avoided and proper ignition and combustion of the blast gas are insured. The principal function of the combustion or ignition chamber in the combination is to convert the latent heat of the blast gases into sensible heat, which is utilized principally for heating the boiler, though partly for maintaining the temperature of the chamber above the temperature of ignition of the blast gas.

Eliminating Smoke in Charging Coke Ovens

In the operation of charging a coke oven with coal, a great quantity of smoke and gas is given off which, unless otherwise provided for, escapes through the charging openings, with consequent inconvenience and loss of valuable material.

John W. Greene, of Syracuse, N. Y., suggests the use of a temporary vent pipe connecting the oven being charged with an adjacent one connected to the gas-collecting system. (Patent 1,485,914; March 4, 1924; assigned to Semet-Solvay Co.) In the accompanying illustration, a, a^1 and a^2 represent smoke vents on adjoining coke-oven chambers. When the coke has been discharged from oven a and before fresh coal is charged, the covers of vents a and a^1 are removed and the movable vent pipe lowered into position so as to connect the two ovens temporarily. When the coal is charged, the smoke and gases, instead of passing to the atmosphere, go through oven a^1 to the hydraulic main or gas-collecting system.



Vent Pipe for Coke Ovens

Rubberized Fiber Composition

Process Which Insures the Coating of Each Individual Fiber with Rubber

In the method for producing rubberized fiber products, described by Paul Beebe, of Akron, Ohio (Patent 1,483,856; Feb. 12, 1924; assigned to the Goodyear Tire & Rubber Co.), suitable fibers are beaten and then mixed in a solution of rubber in a rubber solvent, such as toluol. An agent is then added which will subsequently cause jellation. Sulphur dioxide and hydrogen sulphide may be used to advantage, as these also effect a slow cure or vulcanization. After this treatment, a rubber precipitant such as alcohol or acetone is added, precipitating the rubber on the fibers, which are then formed into a mat on a Fourdrinier machine.

After the material has been formed into a mat with the excess liquid removed, it is immersed in a mixture in which a rubber solvent predominates and is permitted to remain in that condition until a solid jell is formed. After a suitable jell has been produced, the resulting mixture is treated with alcohol, which serves to displace the solvent contained in the rubber and cause it to shrink upon the fibers. This serves to deposit a thin coating of rubber on each of the individual fibers and also intermediate the adjacent fibers, thus eliminating any friction which would develop if the fibers were in direct contact. The rubber serves as a resilient binder and lubricant between adjacent fibers. This permits of freedom of movement of the fibers with respect to each other upon the application of a very slight force, thus producing a very flexible material. The material is then dried.

American Patents Issued March 25, 1924

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests, and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,487,719—Process of Malleableizing Iron. Henry T. Chandler, Marysville, Mich.

1,487,743 — Humidifying Apparatus. William B. Hodge, Charlotte, N. C., assignor to Parke-Cramer Co., Fitchburg, Mass.

1,487,764—Method of Briquetting Peat or Humus. Albert L. Stillman, Plainfield, N. J., assignor to General Fuel Briquette Corporation, New York.

1,487,768—Process of and Apparatus for Recovering the Ammonia Content of Coal Gas. Bates Torrey, Jr., Syracuse, N. Y., assignor to Semet-Solvay Co., Solvay, N. Y.

1,487,845—Gas-Producer Apparatus. Albert L. Galusha, Sharon, Mass.

1,487,846—Method of Operating Gas Producers. Albert L. Galusha, Sharon, Mass.

1,487,869—Apparatus for Producing Gas. Carl Lundin, Pittsburgh, Pa.

1,487,880—Process for the Vulcanization of Caoutchouc. Stanley John Peachy, Davenport, Stockport, England.

1,487,908—Process and Means of Cooling Kilns. Thomas Carlton Albin, Manistique, Mich.

1,487,985 — Gas Producer. David Sudetic, Youngstown, Ohio.

1,487,989—Apparatus for Measuring the Rate of Flow of Gases. Leonard O. Vose, Lincoln, Neb.

1,488,002—Alternate Precipitation of Sodium Bicarbonate and Ammonium Chloride. Georges Claude, Paris, France, assignor to Société l'Air Liquide Société Anonyme pour l'Etude et l'Exploitation des Procèdes Georges Claude, Paris, France.

1,488,009—Substitute Fuel Oil. James J. Kirby, Newark, N. J., assignor, by mesne alignments, of one-half to General Oil Co. of New Jersey.

1,488,011—Air-Heating Furnace. Leif Lee, Youngstown, Ohio.

1,488,053—Baffle for Heat-Exchange Apparatus. Robert McGregor, Ilford, England, assignor of one-third to Clayton & Shuttleworth, Ltd., Lincoln, England, and one-third to Philip Warwick Robson, Lincoln, England.

1,488,055—Kiln for Recovery of By-products From Fuel. Spencer R. Newberry, Cleveland, O.; Andrew W. Newberry, executor of said Spenser R. Newberry, deceased, assignor of one-half to Andrew W. Newberry, and one-half to Arthur C. Newberry.

1,488,079—Machine for Grinding and Pulverizing Friable Substances. Johannes Pieter van Gelder, Granville, near Sydney, New South Wales, Australia.

1,488,216—Apparatus for Treating Organic Material. Willis E. Overton, Baltimore, Md.

1,488,218—Apparatus for Manufacturing Pulp. Charles W. Shartle, Middletown, Ohio.

1,488,239—Process for the Manufacture of Phthalimide. Arthur Georges Green and Stanley Joseph Green, Manchester, England, assignors to British Dyestuffs Corporation, Ltd., Manchester, England.

1,488,248—Process and Apparatus for Heating Rotary Kilns. Hans Holzwarth, Mulheim-on-the-Ruhr, Germany, assignor to Lignite Coal and By-Products Corporation, Minneapolis, Minn.

1,488,274—Art of Making Varnish. Alexander Murray, Springfield, Mass.

1,488,278—Process of Recovering Gases Which Are Formed During the Destructive Distillation of Wood. Clarence F. Ott, Whittier, Calif.

1,488,281 — Manufacture of Threads, Films, Ribbons, etc. Alfred Perl, Chemnitz, Germany.

1,488,294 — Cellulose - Acetate Film. Virgil B. Sease, Parlin, N. J., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

1,488,311—Method of Purifying Silicon-Carbide Crystals. Clarence J. Brockbank, Philadelphia, Pa., assignor to Abrasive Co., Philadelphia, Pa.

1,488,324 —Dehydrator. John H. Drake, Oakland, Calif.

1,488,325—Process for Treating Petroleum. Carbon P. Dubbs, Wilmette, Ill., assignor to Universal Oil Products Co., Chicago.

1,488,355 — Production of Ethers of Carbohydrates Having the Empirical Formula $n(C_6H_{10}O_5)$, Their Conversion Products and Derivatives. Leon Lilienfeld, Vienna, Austria.

1,488,411—Dyestuffs Containing Chromium and Process for Manufacturing of Same. Fritz Straub, Basel, and Hermann Schneider, Riehen, near Basel, Switzerland, assignors to Society of Chemical Industry in Basle, Basel, Switzerland.

1,488,422 — Condenser. Arthur K. Whitelaw, Louisville, Ky., assignor to Standard Oil Co. of Kentucky, Louisville, Ky.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Book Reviews

Information Book for the Chemical Industry

AUSKUNFTSBUCH FÜR DIE CHEMISCHE INDUSTRIE. Compiled by *H. Blücher*. Twelfth revised and enlarged edition, 1671 pages, in two parts. Walter de Gruyter & Co., Berlin. Price, paper covers, 30 gold marks.

To those who have ever had occasion to use this book, it needs no introduction. To define its scope and function so that others may become acquainted with it is somewhat of a problem. Perhaps the literal translation of the title "Information Book" is as useful as any, for the contents combine the features of technical encyclopedia, dictionary of commercial products, and directory of manufacturers of chemicals and chemical equipment (the last feature is, however, limited to German firms).

The mere fact that this book has reached the twelfth edition is sufficient indication of its popularity. Attention has been called to the fact that this is the first edition since the war in which it has been possible to include in detail the developments which took place during that period.

The subject matter is arranged alphabetically and under each heading there is a short discussion of the methods of manufacture and properties of the product (or, where a process is considered, an outline including the principal types of equipment). The treatment is necessarily more concise than that of the larger encyclopedias, but the essential facts have been condensed in a most satisfactory manner. But, after all, the only way to judge a reference book is to use it and it is this recommendation which the reviewer makes to the reader.

A. G. WIKOFF.

Books Received

An Index to Trade Directories

MAILING LIST DIRECTORY AND CLASSIFIED INDEX TO TRADE DIRECTORIES. By *Linda H. Morley* and *Adelaide C. Kight*, of the Business Branch, Newark (N. J.) Public Library under the direction of *John Cotton Dana*. 720 pages. McGraw-Hill Book Co., New York. Price, $10.

Probably every business and professional man has had occasion to refer more or less frequently to trade directories and has been impressed with the amount and variety of information contained in these publications. While it is usually possible to keep in touch with the directories in a single field, difficulty is encountered when expanding markets or other conditions make necessary the collection of similar data in other industries. It is not easy to find out what directories are available or where they may be obtained.

To meet this need, the Business Branch of the Newark Public Library has built up over a period of years the classified reference list of directories which has just been published. It lists over 1,500 directories covering 1,300 trades. Books that give industrial and commercial uses for raw materials and manufactured products, and general directories are listed separately in sections preceding the classified index. Complete directions for using the book most efficiently are also given.

Engineering Pocket Books

MECHANICAL WORLD YEAR BOOK, 1924. 348 pages, illustrated. Emmott & Co., Ltd., London. Price, 1s. 6d.

MECHANICAL WORLD ELECTRICAL POCKET BOOK, 1924. 326 pages, illustrated. Emmott & Co., Ltd., London. Price, 1s. 6d.

These companion books are issued annually by the publishers of *Mechanical World*. They contain an unusual amount of pertinent engineering data and will be found convenient for reference as well as handy to carry.

A.S.T.M. Tentative Standards

A.S.T.M. TENTATIVE STANDARDS, 1923. 859 pages, illustrated. American Society for Testing Materials, Philadelphia, Pa. Price, $7 in paper, $8 in cloth binding.

Tentative standard is the term applied to a proposed standard printed for one or more years with a view of eliciting criticism which will be considered by the committee concerned before final action toward adoption. The present volume contains 170 tentative standards as follows:

Steel, wrought and cast iron	23
Non-ferrous metals	12
Cement, lime, gypsum and clay products	25
Preservative coatings	16
Petroleum products and lubricants	17
Road materials	38
Coal and coke	4
Timber	3
Waterproofing	14
Insulating materials	7
Shipping containers	4
Rubber products	10
Textile materials	7
Thermometers	3
Miscellaneous	6

Synthetic and Natural Fats

FATS: NATURAL AND SYNTHETIC. By *W. W. Myddleton, D.Sc.*, lecturer in chemistry, Birbeck College, University of London, and *T. Hedley Barry*, chemist, B. Winstone & Sons, Ltd. 182 pages, illustrated. Ernest Benn, Limited, London. Price, 25s.

In this book the emphasis has been placed largely on the solid fats prepared from liquid fats by catalytic hydrogenation, with the idea of pointing out how they differ from the natural fats in physical and chemical characteristics and particularly in their behavior when used as substitute fats in various industries. In order to make the comparison it has been necessary to develop the treatment through a preliminary discussion of the chemistry of oils and fats and an outline of the methods of extracting and refining typical natural products. Detailed consideration of the hydrogenated products is then given, followed by a chapter on the application of these synthetic fats in such products as soap, candles, margarine, chocolate fats and shortening fats.

There is also a short chapter on the much-discussed possibility of preparing synthetic glycerides, utilizing fatty acids made from petroleum hydrocarbons and glycerine from fermentation or some source other than the present.

In short, the book covers the whole problem of fat supply and utilization in a most comprehensive and satisfactory manner.

Electroplating

PRINCIPLES OF ELECTROPLATING AND ELECTROFORMING. By *William Blum*, chemist, Bureau of Standards, and *George B. Hogaboom*, electroplating adviser, Bureau of Standards. 347 pages, 23 illustrations. McGraw-Hill Book Co., New York. Price, $4.

In this book the authors have maintained a most commendable balance between theory and practice. It is full of practical details regarding modern American practice, with sufficient theory to make clear the principles underlying each procedure. Careful study of such discussion will result in more intelligent operation of plating departments. In short, the book aims to interpret the results of research in this field in such a way that those in the industry will be able to adapt them to practice without delay.

The word electroforming, used in this book, is suggested as a substitute for the term "galvanoplasty" and is intended to cover the production or reproduction of articles by electrodeposition. It includes electrotyping, the reproduction of phonograph record matrices and the manufacture of tubes and other objects by electrodeposition.

New Treatise on Soap

MODERN SOAP AND DETERGENT INDUSTRY. By *Geoffrey Martin*. In three volumes: Vol. I, Theory and Practice of Soap Making, 400 pages, 140 illustrations. Crosby Lockwood & Son, London. Price, 36s.

It is the purpose of this treatise to fill a gap in the literature of soap manufacture by presenting for the first time all phases of the industry. As Dr. Martin says in the preface: "At the present time no complete work exists dealing with the soap and detergent industry."

This first volume is divided into the following sections: Nature of Soap and Detergent Action; Organic Raw Materials; Inorganic Raw Materials; Perfuming Substances; Manufacture of Soap From Free Fatty Acids; Boiling Process for the Manufacture of Soap; Household and Laundry Soaps.

English and American methods are thoroughly treated and French, German, Dutch and Russian processes are given where these differ materially. It is realized that soap is made on a small scale as well as in huge plants, and accordingly methods of particular interest to the small producer have been included, together with notes on the design and equipment of small plants.

A chapter of particular interest is that on the rapid cooling of soap, a subject which has received more attention abroad than in this country.

The second volume will deal with special soaps and detergents; the third with glycerine recovery.

News of the Industry

Summary of the Week

Two plans are outlined by Tariff Commission for conducting investigation into vegetable oils.

Centralization of German chemical activities are emphasized by pledge of dye company to furnish nitrogen fertilizer through Reparations Commission.

Production of permissible explosives in the United States in 1923 established a new high record.

Statistics for naval stores for the year ended March 31 show a gain in receipts and shipments of turpentine and rosin as compared with preceding year.

Importers take mail vote to decide whether constitutionally of flexible features of tariff should be tested.

Helium bill recommendation expected from the House Committee on Military Affairs.

Detroit Aero Metals Co. is target of several suits, both garnishment and lien.

Bureau of Chemistry to make effort to establish further data on deterioration of agricultural products.

Plans maturing for Denver meeting July 15 to 18, of American Institute of Chemical Engineers.

Importers May Test Flexible Provisions of Tariff Act

The annual meeting of the National Council of American Importers and Traders, Inc., will be held at the Hotel Astor, New York City, on April 8. Among the important questions that will come up for discussion will be the matter of taking action to test the constitutionality of the provisional features of the tariff act. The action of the council no doubt will depend largely on the outcome of a vote that is being taken by mail, the result of which will be made known at the meeting. In asking the views of importers on this subject a letter was sent to a large number of companies engaged in varied lines of the import trade. The letter reads in part as follows:

"The President of the United States has taken action under the flexible provision of the tariff act of 1922 and declared a higher rate of duty than specified in that law on a certain commodity.

"Section 315, Title 3, Special Provisions, provides that the President, after receiving a report from the Tariff Commission, may in his discretion increase or decrease duties not exceeding 50 per cent. The legality of this has been challenged on the ground that it is a delegation of the taxing power which, under the Constitution, is vested solely in the Congress. There is a division of opinion by those qualified to judge.

"The first proclamation by the President under this provision will become effective on April 6. In this instance the increased duty is only upon flour and wheat, but there is reason to believe that the Tariff Commission is proceeding rapidly with several other commodities.

"The board of directors of the National Council of American Importers & Traders, Inc., by practically unanimous vote, has decided that it is of the utmost importance to all trade interests that the constitutionality of the flexible provision be tested by the quickest possible means.

"The directors of the National Council venture no opinion as to the propriety of these prospective changes in rates of duty, nor as to their constitutionality. The directors feel, however, that it is of the utmost importance that this question be quickly settled, to avoid the disturbance that must result so long as there is doubt. Should this paragraph ultimately be declared unconstitutional by the Supreme Court of the United States, all increases or decreases made under it will become null and void, and final adjustments of duty paid must be made, perhaps years hence.

"While no member of the National Council is specially concerned with the import of wheat or flour, it is felt that, as the representative body of importing interests, the council should immediately investigate the practicability of making a quick but orderly test of the law.

"Will you please, therefore, indicate on the inclosed card whether you feel that the National Council should proceed in this matter?"

German Dye Company Controls Fertilizer Plants

The extent to which chemical activities in Germany are centralized is indicated by the receipt in this country of the pledge of the Badische Anilin & Soda Fabrik to furnish 3,600 tons of nitrogen fertilizer through the Reparations Commission during March, April and May. To the contract are appended the names of the plants whose output is under the control of this organization. The list covers fifteen pages and contains nearly 500 names.

Appropriation May Be Granted for Development of Helium

A favorable report on the helium bill will be forthcoming from the Committee on Military Affairs of the House of Representatives in the near future, it is believed. Expressions from members of the committee indicate that they are convinced that the isolation of large reserves of helium is essential to the national defense and offers the incidental advantage of encouraging the commercial use of lighter-than-air ships. Even that development has a military significance, it is pointed out, since commercial aircraft would be available for defense purposes in case of war.

The bill provides for the purchase, leasing and condemnation of lands; for the construction and operation of plants and pipe-lines. As presented to the committee, the bill carries no appropriation, but it is believed that the committee of its own volition will amend the bill by inserting an authorization for an appropriation of $5,000,000.

Apparently the committee is convinced that the President should have authority to permit exports of helium under certain conditions. Serious consideration is being given to the establishment of a commercial line between the United States and the British Isles. The use of helium ships in that service would require the storage of a reserve on the other side to take care of any leakage which might result on the trip over.

Owing to the desire to establish a federal policy with regard to helium at the earliest possible time, steps already have been taken to secure the early consideration of this legislation by the Senate committee. Every endeavor will be made by its supporters to secure the enactment of the bill prior to June 1.

Denver Meeting Plans of Chemical Engineers

Plans for the Denver meeting of the American Institute of Chemical Engineers, to be held from July 15 to 18, are rapidly maturing. Dr. J. C. Olsen, secretary, states that seventy reservations have already been made and that present indications are that a group of about 125 are likely to make the trip.

In addition to the arrangements previously announced for the journey west, a dinner and bus ride are now contemplated at Chicago. The party leaving New York, Saturday, July 12, will in this way be able to spend a few hours on Sunday with the thirty-five or forty Chicago members who will act as hosts during their stopover in that city.

Directly following the meeting at Denver the party will go on to Colorado Springs, where 2 days will be spent. Inspection of the cyanide process of gold extraction at the plant of the Golden Cycle Mining & Reduction Co., will be a feature of the stay at the Springs. The next jump will carry the party to Salt Lake City, where 2 days are allowed for visiting the salt works and the mines of Bingham Canyon.

Yellowstone Park, via the Cody entrance, follows next in order. After spending a few days in sightseeing there the journey will be continued—to Los Angeles, San Francisco and up along the Coast to Seattle. From there the trip to Vancouver will be made by boat. Coming east the party may divide, some including Glacier National Park, some the Canadian Rockies on the way back.

A definite preliminary schedule will be sent out to members within 2 or 3 weeks, when announcement of the program of papers will be made. As outlined in *Chem. & Met.* of Feb. 18, 1924, this program is to deal largely with the technology of beet sugar production. In order to facilitate the arrangement of this program Dr. Olsen is anxious to have the titles of all papers in his hands at the earliest possible moment. All papers are due May 15.

Detroit Aero Metals Co. Is Target of Several Suits

Four suits against the Detroit Aero Metals Co., two on mechanics' liens and two in garnishment, were filed March 24 by William C. Mooney, structural iron contractor, according to an account appearing the day following in the Detroit *Evening News*.

Mooney in his suits, filed by Robert C. Murchie, attorney, asks payment of $4,000. One mechanic's lien suit for $500 was filed in justice court for money alleged due Mooney on his contract for erecting the steel for the boiler house of the plant and the other in the Circuit Court for $1,950 for money alleged due him on the contract for erecting the framework on the purification building, plus additional funds due him for not permitting him to continue at his contract. The total amount of the contract was $9,600.

The two suits in garnishment were filed, one against the company and the other against the Wayne County Home & Savings Bank, where it is alleged the company's financial balance is kept.

The Detroit Aero Metals Co. was organized in 1922 by Glen Lenardo Williams, formerly of Jersey City, N. J., who claims to have a patent process for the extraction of metals from a base called alunite, of which the company is reported to be the owner of large deposits in Utah, according to its stock-selling circulars.

Williams after coming to Detroit formed a local company with a charter from Delaware. The officers are J. E. Thompson, president and chairman of the board; G. L. Williams, vice-president and plant director; D. E. Briggs, industrial engineer, formerly manager Detroit Vapor Stove Works, secretary, and Fred L. Woodworth, internal revenue collector, First District, treasurer.

Chemical Engineers Share in World Power Conference

The chemical engineering group of the Society of Chemical Industry is arranging a chemical and physical section of the World Power Conference which will be held at the British Empire Exhibition at Wembley during June and July, 1924, under the general auspices of the British Electrical and Allied Manufacturers' Association.

The general purpose of the conference will be "to consider how industrial and scientific sources of power may be adjusted nationally and internationally." Scientific societies of the entire world will be in attendance. The United States delegation proposes to explain the character and extent of American power development from both construction and operation standpoints, and give opportunity for setting forth conditions under which American capital has been able to undertake this development.

The industrial phases of power utilization will be represented by three papers, one on Steel Mill Operation by B. H. Shover, consulting engineer, one on the Textile Industry by Charles T. Main, consulting engineer, and the third on the Paper Industry by A. H. White, chief engineer, International Paper Co.

A general review of Electrochemical Progress and Processes in the United States will be given by F. A. J. FitzGerald, of the FitzGerald Laboratories of Chicago. Electric Power in Metallurgy will be discussed by an author to be announced later.

Taking direct part in the conference are the following societies from the United States: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers and the Society of Naval Architects and Marine Engineers.

Arrangements have been concluded with Thomas Cook & Son, transportation agents for the conference, and the Cunard line whereby an allotment of space has been reserved for the delegates, their friends and families, on board the new liner "Scythia," leaving New York June 19.

Petroleum Division of A.C.S. Announces Spring Program

Dr. G. A. Burrell, secretary of the Petroleum Division, American Chemical Society, announces that at the spring meeting of the society, to be held in Washington, D. C., April 21 to 25, members of the Petroleum Division will present about twenty-five papers.

These papers cover a wide variety of subjects related to current problems of petroleum technology. R. E. Wilson heads a group of Standard Oil of Indiana chemists whose papers include discussions of a theory of the mechanism of the action of anti-knock compounds, viscosity of oils at high temperatures, the nature of the acids produced in treating heavy oils with sulphuric acid and boiling point correction chart for normal liquids, with special application to petroleum products. O. L. Barnebey, of the Barnebey-Cheney Engineering Co., is to discuss absorption charcoal; R. B. Moore has a paper on recent helium developments; and A. E. Dunstan, of the Anglo-Persian Oil Co., England, is expected to be present to outline the application of the hypochlorite method to refining.

Gustav Egloff's paper is to deal with some phase of the cracking art; H. T. Moore, of the Sharples Specialty Co., is to take up the subject of turbine oils; W. A. Peters, Jr., of the du Pont company is to present a theoretical discussion of various fractionation methods, and C. L. Voress, of the Gasoline Recovery Corporation, Charleston, W. Va., is to discuss recent work on the charcoal process of extracting gasoline from natural gas.

These papers are mentioned as being of considerable interest to those outside the industry as well as those directly engaged in petroleum work. It is announced that the members of the petroleum and natural gas industries are cordially invited by the American Chemical Society to attend this convention whether they belong to this organization or not.

Chromium's Uses Explained in Address by Mitchell

W. M. Mitchell, metallurgical engineer of E. I. du Pont de Nemours & Co., addressed the Washington chapter of the American Society for Steel Treating on March 21. The subject of the address was "Chromium in Industry." Dr. Mitchell outlined the important uses of chromium in the dye, paint and leather industries and reviewed the extensive literature on the use of chromium in metallurgy.

Describing recent work of his company, he explained briefly the method of coating casting molds with finely divided chromium so that the casting when finished contains a high-chromium alloy surface. This surface is resistant to corrosion and affords one good method of preparing waste parts which must be resistant to chemical or atmospheric action. The method differs radically from the chromium-coating methods used by those who spray or electroplate the surface of metal objects. The chromium alloy on the surface is from $\frac{1}{16}$ to $\frac{1}{8}$ in. thick and therefore behaves differently in service.

Washington News

Chemistry of Deterioration to Be Studied

Bureau of Chemistry Plans to Give Special Attention to Oils and Fats in Present Project

Plans are being laid by the Bureau of Chemistry to concentrate on the chemical problems involved in the deterioration of agricultural products. Special attention is to be given heating and spontaneous combustion. As old as are these problems, Dr. Charles A. Brown, chief of the bureau, points out that comparatively little is known of their chemistry.

In the study of the chemistry of deterioration, special attention is to be given that problem as it applies to oils and fats. In the past the preponderance of research work on deterioration has been confined to canned goods. In the present state of agriculture, when there is overproduction of many commodities, Dr. Brown points out, there is unusual demand for information as to how these products may be stored with the minimum loss from deterioration.

The work on spontaneous combustion is closely related to that being done on dust explosions. D. J. Price, who has been in immediate charge of the research on dust explosions, is now making a tour of the country gathering first-hand information in connection with actual incidents of spontaneous combustion.

The Bureau of Chemistry expects to review and take advantage of the extended research that has been done on spontaneous combustion in coal. Illuminating deductions in that study have been made possible by recent work by Dr. A. C. Fieldner at the Pittsburgh Experiment Station of the Bureau of Mines.

Gain in Chemical Exports for First 2 Months of Year

January-February, 1924, exports of chemicals and allied products advanced 3 per cent from an aggregate value of $21,291,864 in the first 2 months of 1923 to $21,962,042 in the corresponding period of 1924, according to Department of Commerce figures, indicating that the foreign sales were still holding their own. January's trade of the current year, on the whole, was slightly better than February's, when compared with the corresponding period of 1923, and especially when it is remembered that this year contained an additional day. Except for the 20 per cent decrease in naval stores, gums and resins, no unusual incident interrupted the general trend that has been in evidence during the past year.

Although some rather high percentages of increases in value were shown in the exports of some of the minor groups, such as 87 per cent for essential oils and 50 per cent for explosives, the total values of these groups are small as related to the whole. The advances which were made in industrial chemicals, 2 per cent; coal-tar chemicals, 36 per cent; pigments, paints and varnishes, 18 per cent; medicinal and pharmaceutical products, 2 per cent; fertilizers and fertilizer materials, 5 per cent; explosives, 50 per cent; essential oils, 87 per cent, were offset by the declines in naval stores, 20 per cent; vegetable dye extracts, 31 per cent; sulphur, 10 per cent, and perfumery, cosmetics and other toilet preparations, 3 per cent.

Of the coal-tar group colors, dyes and stains, the leading commodity, represented an advance of 37 per cent from a valuation of $775,513 (2,160,242 lb.) in January-February, 1923, to $1,066,442 (3,172,121 lb.) in January-February, 1924. Half as much acetate of lime was shipped abroad in 1924 as in 1923.

German Refineries Specialize in Lubricating Oils

Refining of Germany's domestic production of crude oil, amounting to probably about 50,000 tons (unofficial preliminary estimate) in 1923 and a maximum net import of around 12,000 tons, is centered chiefly in about seven refineries, says a report to the Department of Commerce. All of them specialize almost exclusively on the preparation of lubricating oils. German crude oil is commercially valuable only for its yield of lubricants, its gasoline content averaging but 2 to 3 per cent.

Plans Outlined for Vegetable Oils Investigation

Serious consideration is being given by the Tariff Commission to the scope of its final order for an investigation into vegetable, fish and animal oils, a preliminary hearing on which was held recently, and to the time when such inquiry as is to be undertaken shall begin.

The commission's staff is compiling data regarding the use of all vegetable, fish and animal oils, and the fats of the latter, in the various consuming industries of the United States and it is upon these data that the decision of the commission as to what specific oils and fats shall be included in its investigation apparently will be based, in conjunction with the record of the preliminary hearing on this subject.

But the commission has another phase of this inquiry which is being considered fully; the fact that there remains from its appropriation for the current fiscal year only about $12,000 which can be devoted to new investigations under the flexible tariff. Also, the appropriation for the fiscal year 1925, beginning next July 1, is not as large as that for the current year and the question of expense of each inquiry looms large.

Two plans have been outlined for the commission. One is that a full crew of chemists and accountants be sent to the Orient and another to Europe to begin the foreign investigation immediately, leaving the domestic inquiry to be conducted after July 1 out of the new appropriation. The other is that a smaller staff be sent abroad and a similar small staff placed at work here immediately, to continue until the work is completed. The latter plan would involve more time but would carry the foreign and domestic investigations forward simultaneously.

The vegetable oil investigation is the result of applications for reductions in a number of the oils filed by the Bureau of Raw Materials in behalf of domestic soap, paint and varnish manufacturers.

Glycerine Production of France Estimated at 10,000 Tons

There are no official statistics concerning the production of glycerine in France. It comes on the market exclusively as a byproduct of the soap industry, and at the present time represents almost all of the profit of that business. A leading soap manufacturer estimates the annual output as 10,000 metric tons, but the 1923 quantity was below this amount.

This information is contained in a report from Commercial Attaché Chester Lloyd Jones at Paris. He states that the war caused a decrease in both the export and import trade in glycerine, particularly the import.

It is estimated that the annual consumption of glycerine in France during the years 1921, 1922 and 1923 averaged 7,100 metric tons.

Increase in Chilean Nitrate Industry in 1923

The recovery in the nitrate trade of Chile which resulted in an expansion of output and in a marked gain in the volume of exports is verified by a report from R. H. Squirrell, secretary to the commercial attaché at Santiago. According to this report, Chile produced 19,035,271 metric quintals of sodium nitrate last year. This compared with an output of 10,717,973 metric quintals in 1922. The metric quintal is equivalent to 220.46 lb., so that 1923 production was in excess of 2,000,000 tons of 2,000 lb.

The monthly average of plants operating in 1922 was 39, while at the close of 1923 there were 80 plants in operation. The monthly output also was larger in the latter part of the year, as may be seen by comparing production of 1,349,255 metric quintals in January, 1923, with an output of 1,974,104 metric quintals in December.

Exports of nitrate shared in the general gains made by the industry last year and total shipments from Chile were 12,030,681 metric quintals to Europe, 9,036,993 metric quintals to the United States and 1,503,894 to other countries. These totals compare with 6,026,766 metric quintals, 5,815,088 metric quintals, and 1,230,251 metric quintals as representing 1922 exports to those countries respectively.

Stocks on the coast of Chile at the end of last year are estimated at 8,680,000 metric quintals, as compared with 12,324,000 metric quintals at the end of 1922.

News in Brief

Pulpwood Commission Report Coming Soon—It is understood that the Royal Commission on Pulpwood, which has been holding sittings throughout Canada, will have its report ready for presentation to the Federal Parliament next May.

Old Hickory Fiber Plant Plans Changed—Radical changes have been made in the plans for construction of a new million dollar silk fiber plant at Old Hickory, Nashville, Tenn., for the Buffalo Fiber Silk Co., Buffalo, N. Y., supplementing those previously announced. It is expected that bids will be taken according to the new specifications during this month for construction work.

Helium Purification Plant Under Way—The United States Navy Department has commenced operations at its helium gas purification plant at Lakehurst, N. J., the only such works of its kind in the world, located at the local naval aircraft station. The plant has a rated capacity of 20,000 cu.ft. per hour in the removal of impurities from the helium gas.

Northwestern Oil and Gas Developed—The Sarnia Oil Gas Co. is arranging to spend a large sum in the development of the gas fields in the district of Medicine Hat, Sask. The present proposal calls for an expenditure of $5,000,000 developing carbon black and gasoline extraction in the Many Island Lake district. English interests are said to be the chief backers. The company has acquired gas royalties on 14,000 acres of land. The contracts were secured from the Canadian-American Oil and Gas Co. and the Medicine Hat Development Co.

Keystone State Combines Labs—The Pennsylvania State Department of Agriculture has arranged for a consolidation of the Bureau of Chemistry and the Bureau of Foods, the new unit to be known as the Bureau of Foods and Chemistry. The merger is expected to effect greater efficiency and economy in operation, particularly in connection with the active campaign against misbranded and adulterated food materials unlawfully placed on the market. James Foust will be director of the bureau, and James W. Kellogg assistant director and chief chemist. It is said that no change in the present working force will be made. Mr. Foust is arranging for retirement in April, 1925, when he will have completed his twenty-fifth year of service with the state.

Tar Paper Mills Coming to Canada—The Earl of Dunmore and Harold Bolton, representing the Dominion Tar & Paper Co., recently organized in London, have completed arrangements with the Toronto Harbor Board for a 21-year lease on 5 acres of land with good water frontage on which a factory for tarred paper and other tar products will be constructed. The cost of the factory will be about $200,000. Lord Dunmore states that this will be the first of a chain of factories that the company will construct in the dominion at points where a sufficient supply of tar can be assured and that sites already have been secured in Montreal, Winnipeg and Vancouver.

Gain in Artificial Silk Production—The United States is by far the most important manufacturer and consumer of both real and artificial silk in the world. During the year 1923 production of the artificial product increased by approximately 45 per cent and manufacture of real silk fabrics approached the preceding peak year, according to Commerce Department figures.

Secures Sumatra Rubber Estates—A report from London states that officers of Medan rubber estates declare an American corporation has offered 326,000 of its own fully paid $5 shares for all shares in Medansche (Sumatra) undertaking. Acceptance of this offer would give Medan company 244,500 shares, and directors have deemed it advisable to concur with other stockholders of local undertaking in accepting proposal.

French Chemical Companies Enlarging—According to a report from Paul H. Cram at Nancy, owing to the increasing demand both in the domestic and foreign market, actual stocks of various organic chemical products in France are very low. It is increasingly difficult to secure delivery in less than 2 months. Since the violent fall of the franc the foreign demand has increased in such proportions that many manufacturers contemplate enlarging their factories and in several cases among the more important concerns such work has already been started. During the last few months certain products such as phenol and several alkaloids have tripled in value. Factories have orders for several months ahead, and the rising tendency in prices continues.

Brooklyn Polytechnic Chemists to Meet—The Chemical Society of Brooklyn Polytechnic is planning to have addresses by several eminent technologists at its annual banquet to be held at the Chemists' Club, New York, on April 12. Dr. Charles L. Reese, president of the A.I.C.E., will speak on "Difficulties to Be Overcome in Chemical Engineering"; Paul D. Foote, Bureau of Standards, on "Motion of Electrons in Atoms"; Dr. Benjamin Harrow, Columbia University, College of Physicians and Surgeons, on "Recent Advances in Physiological Chemistry," and Fred H. Lane, works manager of Baer Bros., Stamford, Conn., on "Alumni."

Ammonite Co. in Receivership—Liabilities of the Ammonite Co., in the plant of which an explosion fatal to eighteen men took place on March 1, are set as $90,000, against assets of $20,000. Application on the part of various claimants for funds declared due has resulted in a temporary receivership. Judge Lynch in United States District Court has named George E. Cutley of Jersey City as temporary receiver of the plant.

1923 Newsprint Consumption Breaks Records

Newsprint consumption in the United States during 1923 established a new high record, exceeding the year 1920 by about 28 per cent and the year 1922 by about 15 per cent, the Commerce Department reports.

Although the total net consumption amounted to approximately 2,800,000 tons, mills in the United States produced only 1,506,204 tons. This production was practically all consumed in the United States, export shipments during the year being only approximately 16,360 tons. To make up the remainder, 1,108,390 tons were imported from Canada, representing approximately 80 per cent of the total Canadian production, as well as 200,450 tons from the European mills. The imports also establish a new high record, the purchases from each of the foreign countries exceeding any previous year.

Company Reports

In the annual report of the United Alkali Co., Ltd., of England it is stated that investments in subsidiary and other companies show an increase of £30,000, representing the controlling interest acquired in a well-developed quarry in full working order in North Wales for the due provision of the company's large requirements of limestone. The report also referred to the close co-ordination of mines and consuming works and added that the company has now available very large quantities of pyrites at a cost much below the price at which this raw material for the production of sulphuric acid can be bought from any other source.

E. T. Bedford, president of the Corn Products Refining Co., states that while export business in the last few months has been dull, owing to conditions abroad, the company is preparing to expand its activities in Europe in expectation of a revival of business. The new $2,000,000 modern grinding plant in Germany will be placed in operation in May. Grinding at the Kansas City plant will be discontinued about April 20 in accordance with the company's usual schedule of operations.

At the annual meeting of the American Smelting & Refining Co., F. H. Brownell, chairman of the finance committee, stated that inroads of the boll weevil have greatly increased the demand for arsenic owing to use of calcium arsenate in fighting this pest. This has increased the price to about 11 cents a pound, compared with 4½ cents before the war. The company in 1923 produced the largest tonnage of arsenic in its history, but expects to double this output in 1924, as the arsenic plant at Murray, Utah, is being increased and an arsenic plant will be added to the new smelter being built at San Luis Potosi. Mr. Brownell stated that the Mexican revolution seems to be about over so far as affecting the operations of the company is concerned.

Men You Should Know About

JOHN E. BARTLETT, formerly president of Parke, Davis & Co., Detroit, has been elected president of the Pitt-man-Moore Co., Indianapolis, manufacturer of serums.

D. B. BRADNER, formerly director of research of the Chemical Warfare Service, is now engaged on chemical engineering work in the chemical department of E. I. du Pont de Nemours & Co., with headquarters at Wilmington, Del.

A. A. COREY, JR., New York, president of the Vanadium Steel Co., has been elected a director of the General Refractories Co., Philadelphia, Pa.

V. G. DAWSON has been appointed engineer in connection with development of new properties of the Western Agricultural Chemical Co., Mexia, Tex.

J. B. HILL has resigned his position with The Barrett Co. as chief chemist in the Frankford plant and has taken up the duties of chief research chemist for the Atlantic Refining Co., Philadelphia, Pa., in connection with its newly formed process division.

PAUL F. HOLSTEIN, formerly with the Du Pont Nitrate Co., Taltal, Chile, is now with the American Trona Corporation, Trona, Calif.

CHARLES HURST, mechanical engineer for the Trinity Portland Cement Co., Dallas, Tex., gave an address before the members of the Dallas Technical Club at the Mecca Café, March 25, on the subject of the value and benefit of proper collection of dust at cement mills.

H. S. MONTGOMERY, well known in connection with his work in the electrolytic department of the New Cornelia Copper Co., Ajo, Ariz., is now in charge of the plant of the American Grinding Co., Vernon, Los Angeles.

AUGUST NEUMANN, of Reppen, Germany, designer of a zeolite water softener in use as early as 1907, has been added to the engineering staff of the water-softening division of the Wayne Tank & Pump Co., Fort Wayne, Ind. Mr. Neumann has been connected with several large concerns in Europe and has designed many types of water softeners. He has arrived in Fort Wayne from Germany and will assume his new duties immediately.

J. L. SCHUELER, chief metallurgist of the Keystone Steel & Wire Co., Peoria, Ill., has been appointed superintendent of the open-hearth department of that company, succeeding A. G. Black, who recently resigned to become superintendent of the open-hearth department of the American Sheet & Tin Plate Co., Vandergrift, Pa.

JOHN SEALY, Galveston, Tex., has been elected chairman of the board of directors of the Magnolia Petroleum Co., Dallas, Tex., a recently created office. E. R. BROWN has been elected president of the company; B. H. STEPHENS, vice-president and general manager; E. M. PLUMLY, vice-president and general manager of refineries; W. C. PROCTOR, vice-president and treasurer; COURTNEY MARSHALL, secretary; W. H. FRANCIS, vice-president and general counsel; F. V. FAULKNER, vice-president and production manager; D. C. STEWART, vice-president and pipe line manager; and A. C. EBIE, vice-president and sales manager.

GEORGE F. SMITH, for the past 29 years secretary of the Pittsburgh (Pa.) Paint, Oil and Varnish Club, has been elected president of the organization. Other officers elected are: GEORGE J. MICHEL, vice-president; A. E. DAUM, treasurer; and L. C. STUCKRATH, secretary.

Dr. MAXIMILIAN TOCH, New York, has left the city for his proposed tour of the Orient, where he will give a number of lectures on chemistry.

C. C. TUTWILER, Chestnut Hill, Pa., has been elected president of the Cooper Creek Chemical Co., with plant near Swedeland, Pa. C. S. HENRY has been elected vice-president; and R. JOHN TITZEL, Norristown, Pa., treasurer.

G. W. VINAL, physicist of the Bureau of Standards, addressed the George Washington University Chemical Society on "Storage Batteries, Their Construction, Theory of Operation and Factors Which Affect Them," on the evening of March 19. His address was followed by a paper by J. HOMER WINKLER, of the Bureau of Standards, on "Industrial Alcohol."

Calendar

AMERICAN CHEMICAL SOCIETY, annual meeting. Washington, April 21 to 25.

AMERICAN ELECTROCHEMICAL SOCIETY, Hotel Bellevue-Stratford, Philadelphia, April 24 to 26.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN LEATHER CHEMISTS ASSOCIATION, Spring Lake, N. J., June 18 to 20.

AMERICAN OIL CHEMISTS SOCIETY, New Orleans, La., May 5 and 6.

AMERICAN PAPER AND PULP ASSOCIATION, Waldorf-Astoria, New York, April 7 to 11.

AMERICAN PAPER AND PULP MILL SUPERINTENDENTS ASSOCIATION, Dayton, May 22 to 24.

AMERICAN PHYSICAL SOCIETY, Washington, April 25 to 26.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Cleveland, Ohio, May 26 to 29.

AMERICAN SOCIETY FOR STEEL TREATING, Moline, Ill., May 22 to 23.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, June 23 to 28.

AMERICAN WELDING SOCIETY, Engineering Societies Bldg., New York, April 22 to 24.

CANADIAN INSTITUTE OF CHEMISTS, Queens University, Kingston, Ont., May 27 to 29.

NATIONAL ASSOCIATION OF PURCHASING AGENTS, Boston, May 19 to 24.

NATIONAL FIRE PROTECTION ASSOCIATION, annual meeting, Atlantic City, N. J., May 13 to 15.

NATIONAL LIME ASSOCIATION, White Sulphur Springs, W. Va., May 20 to 23.

PAPER INDUSTRIES EXPOSITION, New York, April 7 to 12.

TAYLOR SOCIETY, Cambridge, Mass., April 24 to 26.

TECHNICAL ASSOCIATION PULP AND PAPER INDUSTRY, Waldorf-Astoria, New York, April 7 to 11.

WORLD POWER CONFERENCE, London, June 30 to July 12.

SOCIETY OF INDUSTRIAL ENGINEERS, Buffalo, April 30 to May 2.

SOCIETY FOR PROMOTION OF ENGINEERING EDUCATION, Boulder, Colo., June 25 to 26.

Obituary

GEORGE W. BERSTLER, for the past 30 years superintendent of the plant of the Fandango Paper Mills, Millburn, N. J., died March 20, in his eightieth year.

Dr. FELIX FRANK, who recently returned from an extended professional tour in Europe, died of asphyxiation on March 24, following a premature explosion in the laboratory of the Catalytic Chemical Co., South San Francisco, Calif. Dr. Frank was alone in the laboratory at the time, engaged on experimental work, details of which are not available. He was a chemist of wide knowledge and keen inventive ability. His researches in recent years included important developments in the manufacture of gas and carbon black from petroleum, and the utilization of low-grade fuels. He was a graduate of the University of Heidelberg.

Dr. MERRITT R. GROSE, professor of chemistry and head of the chemistry department, Temple University, Philadelphia, Pa., died on March 26 from pneumonia, following an illness of less than a week. He was 40 years of age and well known in the chemical industry. He was graduated from the University of Chicago in 1907, and took his doctor's degree at Columbia University. For a number of years he held the teaching fellowship at Harvard University, and taught at Findlay College, Ohio, and the University of Syracuse, N. Y. Later he became a member of the faculty at the Temple University. He is survived by his wife and one daughter, as well as his father, mother and brother.

SIDNEY L. E. ROSE, for 15 years an engineer in the illuminating engineering laboratory of the General Electric Co. at Schenectady, died on March 17 in St. Louis. He was born in Tamworth, Ont., Canada, in 1877. He was graduated from Queens University in Ontario in 1903 and in 1905 joined the General Electric test at Lynn. Two years later he was transferred to the illuminating engineering department and, when this department was moved to Schenectady in 1909, he went with it. For several years he was in charge of the photometric work and was widely known.

Chemicals React in Price and Activity in March

Production Reduced Under Influence of Smaller Distribution—Weighted Index Number Declined

Production and distribution of chemical products in March failed to come up to expectations. While there was a fairly steady call for some selections against old orders, new business was irregular and the apparent slowing up in many industries which are consumers of chemicals had a direct and immediate effect on production of the latter. Reports of overproduction which were common in the latter half of last year were again in evidence and caused producers in many cases to restrict operations.

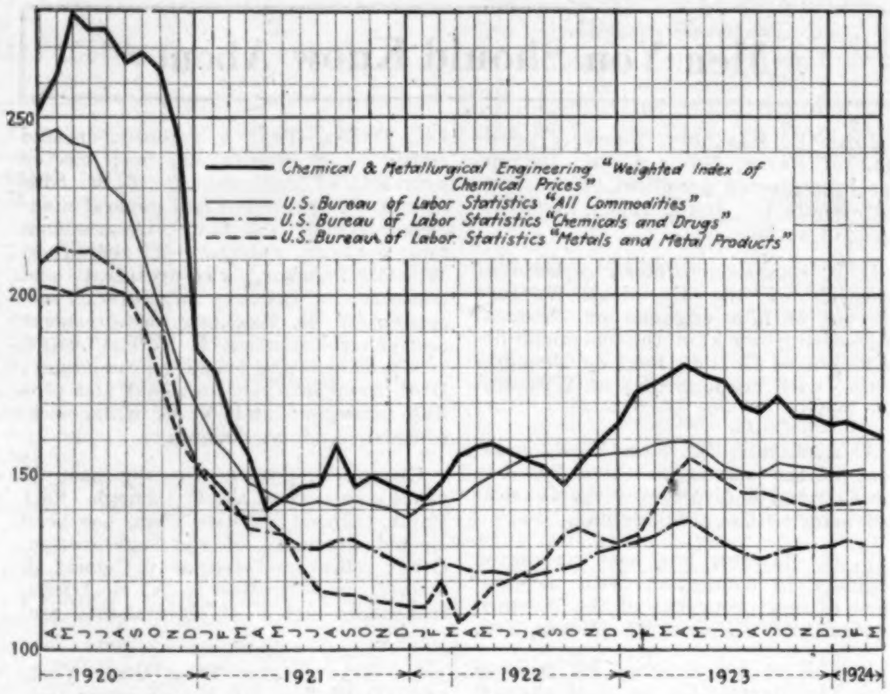
The fact that many consuming industries are largely covered ahead on raw materials takes them out of the market and makes current movement of chemicals appear less active than actually is the case. The tendency of direct dealing between producer and consumer also has been a factor in bringing out reports of slow business on the part of dealers and second hands.

The latest official figures for the export and import trade are for February, and they demonstrate that both branches of the trade have been maintained at very satisfactory levels. Exports of chemical products for the first 2 months of the year were 3 per cent larger than in the corresponding period of the preceding year. Imported chemicals also have been coming to hand in a large way and in many cases goods of foreign origin practically monopolize domestic markets, as domestic grades are not in a position to compete from a price standpoint.

A review of market values for March proves that fluctuations were numerous, with some selections advancing to and maintaining higher price levels, while others were weak and receded to lower figures. The trend of values was downward, judged on a weighted basis, and the index number of *Chem. & Met.* gives an average of 160.55 for the month in comparison with 163.16 for February.

Prominent among the items that contributed to the decline in the index number were acids and wood distillation products. Cottonseed oil sold at new low levels for the movement during the month and this added to the weak side of the market. Other vegetable oils and fats shared in the easier price movement.

The U. S. Bureau of Labor in reporting on prices for February states that strong advances in prices of certain fuels during the month caused a slight rise in the general wholesale price level as measured by the index number. This index number, which includes 404 commodities of price series weighted according to their commercial importance, registered 152 for February compared with 151 for the preceding month. Chemicals and drugs, however, were lower than in January, the numbers being 131 and 132 respectively. Metals and metal products moved from 142 to 143 in the month.



Lower Gas Quality Forecast

It is reported that the Indiana Gas Association has secured support of certain university professors in its effort to have the heating value requirement for gas reduced by the Indiana Public Service Commission. A similar attempt is being made to reduce gas quality in the city of Detroit, it is reported, through the efforts of the city research engineer. This officer is quoted as testifying that gas of 530 B.t.u. per cubic foot will give the housewife as good or better service than gas made to meet the present 660 B.t.u. standard. No decision has been announced in either locality as to the official conclusions reached in these investigations.

Naval Stores Trade Larger Last Year

The fiscal year in the naval stores industry, which ended as of March 31, indicates that the trade in rosin and turpentine was larger than in the preceding year. Statistics for the year follow. Receipts for 1923-24 were: Turpentine, 136,392; rosin, 473,961; while the receipts for 1922 were: Turpentine, 102,286; rosin, 388,272. The shipments for 1923-24 were: Turpentine, 135,160; rosin, 489,544; while the shipments for the previous year were: Turpentine, 103,196; rosin, 428,371.

German Company May Contract for Mexican Rubber Output

Private reports from Mexico state that a large German company will become active in Mexico in May. This company, which is not named but is described as having the financial backing of leading financiers in Germany, is expected to place contracts for the entire rubber production of Mexico. Castor seed also is mentioned as a commodity in which the German company is interested.

Trade Notes

The Druachem Club will move to new quarters at 15 John St., New York City, on May 1.

The Geigy Co., of New York City, has been granted a drawback on exports of tannic acid made from imported tannic acid by the addition of glauber salts or other domestic reducing material.

B. H. Goddin, formerly sales manager of the Hoffmann-La Roche Chemical Works, is now associated with McIlvaine Bros., New York City, in the capacity of general sales manager.

It was reported last week that C. Wilbur Miller, president of the Silica Gel Corporation, who is now in Europe, had closed a contract for the use of silica gel by the National Benzol Association, Ltd., of England.

Alpin I. Dunn, for several years a member of the firm of Cook & Swan Co. and for the past year manager of the fish oil department of the National Oil Products Co., of Harrison, N. J., has resigned from the latter company.

W. N. Pearce, secretary to the commercial attache at Lima, Peru, announces that the tariff on sodium cyanide imported into that country has been fixed at 10 per cent ad valorem, provided it is imported in uniform quantities exceeding 500 kilos.

The Standard Soap Co., Ltd., Toronto, has purchased a larger plant and is enlarging its capacity considerably by new equipment in anticipation of increased business. The new property was bought from the Canadian Woollens, Ltd. The soaps made by the company are especially designed for the needs of the Canadian textile industry.

Market Conditions

Lower Price Schedules for Tin Salts Features Trading in Chemicals

Buying Orders Held Down to Moderate Sized Lots—Production Reported to Have Been Curtailed

CONFIDENCE in a sustained buying movement for chemicals has been weakened by reports of quiet conditions in large consuming industries. As a result of the apathy of buyers in recent weeks it is said that production of many chemicals has been cut down so as to avoid heavy accumulations at plants. Stocks of finished products also are reported as fairly large and this has tended to lessen call for contract deliveries of raw materials as well as to check new buying.

As typical of the present situation it is pointed out that prices for soap have been reduced under competition and call for soap-making chemicals and oils has slowed up pending the working off of surplus stocks of the finished material. It is further stated that the lower sales prices for the latter influence producers to expect correspondingly low prices for materials. In short the quiet position of many producing interests has brought about a buyers' market which may continue until demand becomes more active.

The weighted index number for the week responded to the easier tone of values in general and receded to 158.28 as compared with 160.16 for the preceding week. In connection with the quoted prices it is also noted that there are many chemicals on which private terms may be arranged.

Weather conditions have been a factor in retarding business in some lines and thus causing buying to fall below seasonal standards. This is apparent from reports emanating in the agricultural sections which show backward conditions and partly account for the relatively slow demand for fertilizer and other agricultural chemicals.

Acids

Under the influence of lower producing costs as represented by acetate of lime, manufacturers of acetic acid have announced lower prices for their products. The lowering in prices, however, has been hardly more than a readjustment of quotations to sales prices as the quotations had been shaded freely in recent transactions. The market for domestic acids in general is easy in tone with buying orders irregular and prices largely depending on individual sales, quantities, etc. The trend is indicated by reports that sulphuric acid cannot be sold at prices which a short time ago were regarded by buyers as favorable.

The position of imported acids is hardly any firmer than that for those of domestic origin. Demand for citric and tartaric acids has been quiet and prices have been influenced more by demand than by replacement costs. Imported oxalic acid is finding keen competition from domestic makers and prices are too low to encourage heavy importations.

Tin Salts Sharply Reduced in Price—Caustic Soda for Export Irregular—Arsenic Lower for Shipment — Prussiate of Soda Still Declining—Bichromates Quiet but Steady—Imported Sal Ammoniac Firm—Antimony Products Less Firm

Potashes

Bichromate of Potash—This material has been held in a steady position in recent weeks despite a quiet call from consumers. Production is reported to have been kept in harmony with demand and in the absence of selling pressure values have been easily maintained at 9½@9¾c. per lb.

Caustic Potash—There was one lot of imported material on spot on which a bid of 6½c. per lb. would have found acceptance but the inside price in other quarters was 6⅝c. per lb. Goods afloat were offered at 6½c. per lb. and shipment from the other side was quoted at 6¼c. per lb. and the continuance of this figure for future deliveries gives a steady tone to the spot market and is regarded as a sign that values will not move much in either direction.

Chlorate of Potash—Routine conditions prevail with very little call for spot goods. While imports so far this year have been heavy, they have been readily absorbed and unsold stocks are not large. Imported grades on spot are quoted at 7¼@7⅝c. per lb.

Permanganate of Potash—There has been a disposition on the part of some sellers to mark up prices for this material and asking prices of 14¼@14½c. per lb. have been heard for spot permanganate. There are sellers, however, at 14c. per lb. and demand during the past week was said to have been quiet.

Prussiate of Potash—The market for red prussiate is slow and asking prices of 42@43c. per lb. are little better than nominal. Yellow prussiate is holding a wide differential over soda but prices have been fairly steady and spot holding are quoted at 19½@20c. per lb. Shipments are held at 19@19½c. per lb.

Sodas

Acetate of Soda—Recent buying is said to have covered requirements in some quarters but moderate interest is shown in this material. Producers are now holding more on a uniform price basis with carlots offered at 5c. per lb. f.o.b. works.

Bichromate of Soda—Some sellers admit that business is not active, which they attribute to restricted operations in consuming industries. Producing costs, however, are unchanged and stocks of bichromate are being sacrificed. Some producers are not carrying surplus stocks and production in general is reported to have followed the buying movement. The fact that contracts were placed under the current spot price was thought favorable for resale offerings but the lack of competition from sellers has been a feature of the market. Current prices are 7½@7¾c. per lb.

Caustic Soda—In spite of reports to the contrary the price for export is irregular and is subject to negotiation. This is proved by a sale of a moderate amount during the past week on a basis of 2.90c. per lb. f.a.s. New York. The export prices openly quoted range from 3c. to 3.05c. per lb. Prices for the domestic trade appear to be more stable and while reports of shading are current from time to time, it is known that bids under the quoted levels have been refused. The contract price is repeated at 3.10c. per lb., for carlots at works. Prompt shipment from works commands a premium of 10c. per 100 lb. over the contract figure.

Nitrate of Soda—Reports from Chile state that sales in March were larger than in February. Shipments in February were 207,749 metric tons, which was about 60,000 metric tons less than in February, last year. Shipments from March 1 to March 15 were 100,200 metric tons. Spot holdings of nitrate are small in the local market and in spite of recent arrivals at southern ports, unsold stocks are said to be limited. Prices are quoted at $2.50@$2.55 per 100 lb. depending on seller and location.

Prussiate of Soda—Values continue to give way under the slow buying movement. Spot stocks are reported to have changed hands at 10½c. per lb. but 10⅝c. per lb. is asked in most quarters, though the lower figure is said to be still available. Shipments from abroad are freely offered at 10¼c. per lb. but are not attracting attention.

Soda Ash—Exports of soda ash in February amounted to 1,803,668 lb. as compared with 2,236,226 lb. in February, last year. Exports are still said to be running below last year's standards but are of fair volume. Deliveries of dense ash to domestic consumers is reported as active with a satisfactory movement of light ash. The market is holding a steady tone with contract prices unchanged at $1.25 per 100 lb. in bulk; $1.38 per 100 lb. in bags; and $1.63 per 100 lb. in bbl. Dense ash is quoted at $1.35 per 100 lb. in bulk; $1.45 per 100 lb. in bags; and $1.69 per 100 lb. in bbl. These prices are for carlots f.o.b. producing points.

Miscellaneous Chemicals

Acetate of Lime—The decline in price as announced in the preceding week has remained effective and it is expected that current values will lead to a more extensive buying both for home and export. The asking price is $3.50 per 100 lb.

Arsenic—There is little to be said about the market as far as trading is concerned. Domestic producers are said to be making deliveries regularly on contract and are not pressing sales in the open market. Imported arsenic is quiet with spot holdings available at 11¼@11½c. per lb. Call for spot goods is restricted not only by the inactivity of manufacturers but also because of the lower prices quoted for shipments. Nearby shipment from Japan was offered at 9½c. per lb. during the week. Inquiry is heard for calcium arsenate but bids are mostly under asking prices and 11¼c. per lb. at works appears to be a firm quotation.

Copper Sulphate—Good deliveries of domestic sulphate are reported against old orders with scattered buying for new lots. Prices quoted for domestic show some variation according to seller, grade and quantity with the quoted price sometimes applying to delivery at consumer's plant. Asking prices are 4.85@5c. per lb. Imported sulphate was quiet last week with spot holdings, 98-99½ per cent, large or small crystals, offered at 4.60c. per lb. Shipments are offered at 4.40c. per lb.

Formaldehyde—There has been no indication of weakness in this market. Stocks have been moving freely and first hands have been in control of the market. Large lots are offered at 11c. per lb. with smaller amounts held at 11½c. per lb.

Magnesite—A good call is reported for the various grades. Caustic calcined Grecian is offered at $50@$51 per ton c.i.f. New York. Calcined lump, 85 per cent, is quoted at $35 per ton and calcined ground, 200 mesh, at $45 per ton. The latter prices are f.o.b. mines in California. Dead burned is quoted at $32@$34 per ton f.o.b. western points and at $40@$42 per ton f.o.b. Pennsylvania producing point.

Sal Ammoniac—Reports are heard that some off-grade material has been on the market and that prices have varied according to quality. For prime white goods of foreign make there are sellers on spot at 6⅝c. per lb. Material afloat is offered at 6½c. per lb. and shipments can be bought at 6¼c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	158.28
Last week	160.16
April, 1923	180.00
April, 1922	158.00
April, 1921	140.00
April, 1920	261.00
April, 1919	231.00
April, 1918	286.00

Weakness in acids and arsenic is reflected in the index number which went off 188 points in the past week. Higher prices obtained for cottonseed and linseed oils.

Tin Salts—The average price for straits tin for March was 54.87c. per lb. The high prices which the tin salts had reached is said to have cut down demand and sharp reductions were made in the selling schedules for April deliveries. Bichloride of tin is down to 14c. per lb., tin crystals to 35½c. per lb., and tin oxide to 58c. per lb.

Zinc Dust—Call from the textile trade has been moderate with other consumers taking fairly normal amounts. Prices quoted vary according to seller and grade with 8c. per lb. and upward representing the market. Some sellers are including delivery in their quoted prices.

Alcohol

There was a steady tone to the market for denatured alcohol so far as first hands were concerned and prices underwent no quotable change. Second hands offered supplies more freely. Completely denatured, formula No. 5, held at 44½c. per gal., in drums, carload basis. Ethyl spirits, 190 proof, U.S.P., in bbl., was offered at $4.81 per gal., tax paid.

The methanol market was inactive and prices were unsettled. It was reported that the market could be shaded on a firm bid. Nominally the prices held on the basis of 93c. per gal. for the 95 per cent grade, in bbl. Pure was offered at 90c. per gal., in tank cars, works.

Coal-Tar Products

Benzene Stocks Light and Prices Firm—Refined Naphthalene in Better Demand—Phenol for Future Delivery Unsettled

PRODUCERS of benzene report moderate holdings and a steady market. The bulk of the output is being absorbed in the motor fuel field and, with no important change in the gasoline situation, traders take an optimistic stand as regards the near future. Production during March was larger than a year ago, but prices obtained were slightly lower. Refined naphthalene attracted more attention, business showing improvement, a seasonal development. Phenol was unsettled on reports to the effect that futures might be secured to better advantage of prospective buyers, supplies being available for July forward delivery. There was no important change in the cresylic acid situation, offerings being plentiful and prices rather soft, especially on low-grade material. Keen competition prevailed in most of the intermediates, and prices named covered a wide range depending upon the quantity and seller.

Alpha-Naphthylamine — The market was just about steady at 35c. per lb., in bbl., prompt shipment from works. On forward material this figure might have been shaded.

Benzaldehyde—The technical grade was offered more freely and prices were unsettled, closing at 68@72c. per lb.

Benzene—Offerings of 90 per cent and the pure grade continue light, because of the good call for the motor fuel variety, and prices in all quarters continue on a rather firm basis. But first hands do not expect prices to change unless another advance takes place in the petroleum product. On 90 per cent benzene the quotation held at 23c. per gal., and on the pure at 25c. per gal., tank cars, f.o.b. point of production.

Cresylic Acid—During the past week several shipments of cresylic acid and coal-tar distillate arrived from British ports. The demand was fair, but supplies were ample and prices, in some directions, were more or less nominal. The undertone of the market was easy. On the 95 per cent grade 65c. was asked, with the 97 per cent grade at 68@70c. per gal. Foreign markets for crude were unsettled on fairly liberal offerings.

Naphthalene—There was a better demand for refined material, but prices did not change, as offerings were large. Traders do not look for so much action in the way of price changes as occurred a year ago, supplies available being considerably in excess of stocks held here in the spring of 1923. White flake held at 6@6½c. per lb., with ball at 7@7½c. per lb. Chips were unsettled at 5@5½c. per lb. Crude to import offered freely at 2¼@2½c. c.i.f. N. Y., on good quality material.

Paranitraniline—Demand inactive and prices barely steady at 68@72c. per lb., in bbl., prompt delivery.

Phenol—Prompt shipment U.S.P. phenol sold at prices ranging from 29@30c. per lb. The demand was quiet and offerings increased in more than one direction. First hands showed willingness to offer futures on more liberal terms, one operator asking 26c. on July forward business. Leading interests held out for 28c. on forward business.

Solvent Naphtha—Trading was described as fair, but with stocks small prices ruled firm on the basis of 25c. per gal. on the water-white grade, tank cars, f.o.b. works.

Xylene—Producers quote 40c. per gal. on pure xylene, in tanks, prompt shipment from works. Demand quiet and prices barely steady. Commercial grade unchanged at 28c. per gal., tank car basis.

Vegetable Oils and Fats

Crude Cottonseed Higher—Linseed Quiet—China Wood Again Lower—Palm Oils Decline—Coconut Steady—Greases Firm

DEMAND for technical oils and fats was not so active as a week ago, but the undertone of the market was better, bids for linseed, tallow and good quality greases at concessions meeting with refusals. China wood oil was an exception, selling pressure resulting in another sharp decline in the market for prompt as well as forward material. Cottonseed oil met with good support from one refiner, and, on renewed buying of a speculative character, prices moved upward.

Cottonseed Oil—Early in the week prices were lower, but later the market steadied so that net changes showed moderate advances. Crude oil sold at 8⅝c. per lb., tank cars, f.o.b. mills, Southeast, and at 8¼c. per lb., f.o.b. mills, Texas, an advance of ¼c. per lb. Holdings of crude throughout the South were light and in firm hands. Refiners bought the nearby options in the New York market for refined prime summer yellow oil, the May position being below the crude oil parity, settling around 9.92 per lb. Speculators switched quite a little May oil into the July and September positions. New crop developments were not favorable and this brought out renewed buying interest in the South. One of the leading refiners, in an analysis of the Feb. 29 statistics, places the visible supply of oil, including seed yet to be received, at 1,239,470 bbl., which compares with 1,083,097 bbl. on the corresponding date a year ago. This same factor places the amount of refined oil consumed over the first 7 months of the season at 1,324,328 bbl., compared with 1,593,291 bbl. a year ago. Because of the poor quality of the seed the refining loss during the 7 months ended Feb. 29 was 9.35 per cent, which compares with 7.29 per cent in the preceding year. Consumption of refined oil in March was good, according to trade authorities, and private estimates on distribution range from 160,000 to 175,000 bbl. Should business continue good the statistical position of the market might reverse itself before the end of the season. It is on this point that opinion differs. Unless lard advances it is not considered likely that consumption will increase materially. The stocks of lard in Chicago on April 1 amounted to 33,141,846 lb., against 22,051,713 lb. on March 1, and 13,495,496 lb. a year ago.

Linseed Oil—New business was disappointing, yet the market steadied a little, reflecting higher seed prices and continued weakness in cake. Deliveries against old contracts absorbed the bulk of the production and several crushers have virtually no surplus in sight for the next month or so. Nearby oil was quite steady towards the close, bids for May at 87c. per gal., carload basis, cooperage included, being turned down. May oil closed at 88c. asked. Prompt shipment was raised to 90c. per gal. by sellers who quoted 89c. a week ago There was no buying interest in June forward and the market was considered wholly nominal at 86@88c. per gal., depending upon the quantity and the seller. Crushers were reported to be in need of nearby seed. There was a better call for seed in the Northwest, while cheap c.i.f. offerings of Argentine seed were withdrawn. Private advices from Buenos Aires reported a falling off in receipts of flaxseed at interior points, and, this was given as one of the reasons for the firmer feeling in the market. The cake situation was weak, April shipment to Europe closing around $34@$35 per ton, f.a.s. New York.

China Wood Oil—Arrivals have increased and, with no improvement in demand, forced selling sent prices to much lower levels, both here and on the Pacific coast. On the coast tank cars for May-June shipment closed nominally at 13½c. per lb., but even lower prices were mentioned during the week. In New York tank car deliveries were nominal at 15½c. per lb. For oil in cooperage 16c. could have been done.

Argentine Flaxseed Exports to Europe Heavy

The Argentine continues to ship large quantities of flaxseed, confirming reports that the crop raised in 1923 was larger than in the preceding season. The heavy buying on the part of Continental crushers has sustained prices. Shipments from the Argentine from Jan. 1 to Mar. 28, by countries, follow:

	1924 Bushels	1923 Bushels
United Kingdom...	3,068,000	1,892,000
Continent.........	10,002,000	7,088,000
United States......	6,448,000	7,828,000
On orders.........	3,936,000	3,936,000
Total...........	23,454,000	20,744,000

Corn Oil—The market was firmer in sympathy with crude cottonseed oil. Last sales were put through at 8½c. per lb., sellers' tank cars, f.o.b. point of production. Some traders now ask 8⅝c. per lb.

Coconut Oil — While no important business was placed the market steadied. Offerings of Ceylon type oil at 8c. per lb., tank cars, Pacific coast points, were few, most holders advancing to 8⅛c., all positions. In New York 8⅝c. was asked, although it was reported that a bid at 8½c. might be accepted on a firm bid. Copra was steady on good buying of nearby stuff on the coast at 5c. per lb., c.i.f. terms.

Olive Oil Foots—On ex-dock delivery 9⅝c. could have been done. Spot prime green held at 9¾c. per lb., with demand routine only.

Palm Oils—Lagos oil for shipment was offered down to 7c. per lb., c.i.f. New York. Niger held at 6.60c. per lb. Demand quiet because of cheap tallow.

Red Oil—Distilled red oil offered at 8⅝c. per lb., tank cars, prompt shipment from works. Market irregular, prices varying according to seller.

Soya Bean Oil—No buying interest. Odd lots held on the Pacific coast at 10¼c. per lb., tank cars, duty paid, nearby delivery.

Tallow, Etc.—The sale of 100 drums of extra special tallow went through at 7⅝c. per lb., f.o.b. plant, the market being unchanged for the week. Greases in good demand and choice yellow sold at 6¾@7c. per lb. Export inquiry developed for No. 1 oleo oil, with sales at 12½c. per lb. Oleo stearine firm at 9½c., nominal. Lard compound inactive at 11¾@12c. per lb., in bbl.

Miscellaneous Materials

Antimony—Market easier on increased offerings. Chinese and Japanese brands offered at 10¾@11c. per lb. Cookson's "C" grade 14@14½c. per lb. Chinese needle lump nominal at 7½@8½c. per lb. Standard powdered needle, 200 mesh, 9@10c. per lb. White oxide, Chinese, 99 per cent, 10@11c. per lb.

Barytes—Crude quoted at $8 per ton, Missouri mines, 90@98 per cent BaSO. Ground off color $13 per ton, Baltimore. Water ground and floated $23@$25 per ton, f.o.b. St. Louis. Good demand reported for crude and ground; undertone steady.

Glycerine — Refiners advanced the market for chemically pure to 17c. per lb., in drums, the uplift being in sympathy with crude. In the Chicago district, however, chemically pure held at 16@16½c. per lb. Dynamite steady at 16c. per lb., with offerings scanty. Crude soap lye, basis 80 per cent, firm at 11c. per lb., loose, carload lots. Several shipments of crude arrived from the Continent in the past week.

Naval Stores—High prices prevailed for rosins, the market on the lower grades settling at $5.90 per bbl. Turpentine was unsettled, demand showing no improvement. There were offerings at $1.01 per gal., in bbl., immediate delivery, a decline of 3c. for the week.

Shellac—Prices eased off on lower markets abroad, T.N. closing at 57c. per lb. Bleached bonedry was offered at 67c. per lb., which compares with 68@69c. a week ago.

White Lead — Production of white lead in oil in 1923 is reported at 260,976,600 lb. as compared with 292,588,900 lb. in 1922. The market for pig lead is easing up and while 9c. per lb. is quoted by prominent producers there have been offerings at 8⅝c. per lb. for prompt and 8½c. per lb. for forward positions. There is a good call for white lead with prices steady at 10½c. per lb. for the dry product, in casks, carload lots.

Zinc Oxide—According to the Bureau of the Census the production of zinc oxide in oil in 1923 reached 17,452,800 lb., which compares with 9,944,400 lb. in 1922, 6,134,000 lb. in 1921 and 8,538,000 lb. in 1920. The market for the dry material underwent no change in the past week. With the metal easier the undertone was barely steady. Lead free held at 7¾c. per lb. French process, red seal, offered freely at 9⅝c. per lb., with green seal at 10⅝c. and white seal at 12c.

Imports at the Port of New York

March 28 to April 3.

ACIDS—Citric—20 csk., Palermo, Order. **Boracic**—200 bg., Leghorn, Pacific Coast Borax Co. **Cresylic**—10 dr., Manchester, E. H. Watson; 23 dr., Manchester, Hetherman & Co.; 85 dr., Liverpool, Lehn & Fink; 40 dr., Liverpool, W. E. Jordan. **Oxalic**—10 csk., Rotterdam, Jungmann & Co. **Stearic**—20 cs., Rotterdam, M. W. Parsons & Plymouth Organic Lab. **Tartaric**—410 csk., Rotterdam, Order; 60 bbl., Genoa, Order; 100 csk., Rotterdam, Chemical National Bank; 550 keg and 100 bbl., Rotterdam, W. Benkert & Co.; 200 bbl., Genoa, L'Appula Soc. Anon.

ALUMINA HYDRATE—450 bg., Rotterdam, R. W. Greeff & Co.

ALUMINA SULPHATE—180 bg., Rotterdam, R. W. Greeff & Co.

ALCOHOL—100 bbl. denatured, Arecibo, C. Esteva.

AMMONIUM CARBONATE — 67 bbl., Dunkirk, C. Hardy, Inc.

ANTIMONY—250 cs. crude, Hankow, Asia Banking Corp.

ANTIMONY REGULUS — 1,550 cs., Shanghai, Wah Chang Trading Co.; 400 bg., Honkow, Asia Banking Corp.; 500 cs., Hankow, Columbia Bank; 349 cs., Hankow, Irving Bank-Col. Trust Co.

ANTIMONY SULPHIDE—23 csk., London, Order.

ARSENIC — 700 cs., Shanghai, Wah Chang Trading Co.; 50 csk., Antwerp, Roessler & Hasslacher Chemical Co.; 410 cs., Shanghai, Wah Chang Trading Co.

BARIUM BINOXIDE — 124 cylinders, Havre, Mallinckrodt Chemical Works.

BARIUM CHLORIDE—184 csk., Rotterdam, E. Suter & Co.

BARYTES—300 bg., Rotterdam, E. L. Bullock Sons.

BAUXITE—64 tons, Paramaribo, A. M. Kohler.

BLEACHING POWDER — 125 csk., Liverpool, H. Kohnstamm & Co.

CASEIN—417 bg., Buenos Aires, International Acceptance Bank; 417 bg., Buenos Aires, West Virginia Pulp & Paper Co.; 417 bg., Buenos Aires, West Virginia Pulp & Paper Co.; 2084 bg., Buenos Aires, Kalbfleisch Corp.; 1,251 bg., Buenos Aires, Brown Bros. & Co.

CHALK—800,000 kilos, Dunkirk, J. W. Higman Co.; 268,000 kilos, Dunkirk, Taintor Trading Co.; 480,000 kilos, Antwerp, Taintor Trading Co.; 800 bg. and 134 bbl., Antwerp, L. A. Salomon & Bros.; 1,480 bg., Antwerp, Bankers Trust Co.; 275,000 kilos, Dunkirk, Taintor Trading Co.; 800,000 kilos, Dunkirk, J. H. Higman.

CHEMICALS — 100 cs., Havre, T. S. Todd & Co.; 3 bbl., Havre, Wallerstein Laboratories; 185 dr., Antwerp, Roessler & Hasslacher Chemical Co.; 160 carboys and 25 csk., Rotterdam, Roessler & Hasslacher Chemical Co.; 31 csk., Havre, Roessler & Hasslacher Chemical Co.; 12 cs., Havre, Fougera & Co.; 106 csk., Barcelona, Order; 9 cs., Antwerp, F. B. Vandegrift & Co.

CHROME ORE—1,000 tons, Beira E. J. Lavino & Co.

COAL-TAR DISTILLATE — 269 dr., Liverpool, Order.

COLORS—9 bbl. aniline, Rotterdam, H. A. Metz & Co.; 5 csk. do., Rotterdam, Kuttroff, Pickhardt & Co.; 16 pkg. aniline, Kobe, Order; 20 csk., Havre, Reichard-Coulston, Inc.; 8 csk., Havre, Carbic Color & Chemical Co.; 6 csk., Havre, Geigy Co.; 5 csk., Havre, Ciba Co.; 3 csk., Havre, Sandoz Chemical Works; 3 csk. aniline, Genoa, Irving Bank-Col. Trust Co.; 28 csk. aniline, Genoa, Order; 33 csk. do, Genoa, American Exchange National Bank; 7 bbl. aniline, Genoa, Bachmeier & Co.; 7 bbl. do, Genoa, Bank of the Manhattan Co.; 5 csk. alizarine, Liverpool, Standard Bank of South Africa; 2 keg, Havre, Irving Bank-Col. Trust Co.

COPPER SULPHATE—100 csk., Antwerp, Herrick & Voight; 100 csk., Antwerp, Percival Falkingham, Inc.; 100 csk., Antwerp, J. D. Lewis; 100 csk., Antwerp, Ellis, Jackson & Co.

DIVI-DIVI—219 bg., Maracaibo, E. J. Halley.

FERROMANGANESE — 60 cs., Havre, Order.

FUSEL OIL—12 dr., Marseilles, Order.

FULLERS EARTH—500 bg., London, L. A. Salomon & Bros.

GLYCERINE—40 dr., Marseilles, Order; 96 dr. crude, Buenos Aires, Tupman, Thurlow Co.; 20 dr., Marseilles, Order; 10 dr., Havana, C. J. Schelling & Co.; 10 dr. crude, Dunkirk, Order.

GRAPHITE—163 bg., Havre, International Ores & Metals Co.; 460 bg., Havre, J. Elwell & Co.; 2038 bg., Havre, C. Pettinos.

GUMS—206 bg. copal, Manila, Innes & Co.; 80 cs. damar, Singapore, Brown Bros. & Co.; 759 bg. copal, Antwerp, Chase National Bank; 100 cs. damar, Batavia, France, Campbell & Darling; 100 cs. do, Batavia, A. Klipstein & Co.; 199 bg. damar, Singapore, Brown Bros. & Co.; 100 cs. do, Singapore, Standard Bank of South America; 150 cs. do, Singapore, Order; 300 cs. damar, Padang, Order; 175 cs. damar, Singapore, Order; 245 bg. damar, Singapore, Order; 100 cs. damar, Batavia, Order; 728 bg. copal, Belawan, Order; 1,231 bg. copal and 100 cs. damar, Macassar, Order; 200 bg. copal, Antwerp, Brown Bros. & Co.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CANDLE-MAKING MATERIALS, such as beeswax, paraffin wax and stearin. Dublin, Ireland. Purchase.—9686.

CAUSTIC SODA, 50 tons; and potassium bichromate in shipments of 10 to 20 tons. Vienna, Austria. Purchase. —9662.

CHEMICALS. Geneva, Switzerland. Agency.—9665.

CHEMICALS. Caracas, Venezuela. Agency.—9666.

CHEMICALS AND DYES. São Paulo, Brazil. Agency.—9712.

FERTILIZERS. Geneva, Switzerland, Agency.—9665.

METHANOL, 100,000 kilos, for denaturing alcohol. Montevideo, Uruguay. Purchase.—9660.

PAINTS, oils and turpentine. Habana, Cuba. Agency.—9701.

PAINTS, varnishes, artists' colors, and novelties in these lines. Copenhagen, Denmark. Agency.—9661.

ROSIN AND TURPENTINE. Vienna, Austria. Purchase.—9662.

IRON OXIDE—55 csk. red, Hull, J. Lee Smith & Co., 180 bbl., Malaga, C. J. Osborn & Co.; 266 bbl., Malaga, C. K. Williams & Co.; 54 csk., Liverpool, J. Lee Smith & Co.; 114 csk., Liverpool, C. B. Chrystal & Co.; 71 csk., Liverpool, Reichard-Coulston, Inc.; 5 csk., Liverpool, Hanson & Van Winkle Co.; 44 csk., Liverpool, J. A. McNulty; 20 pkg., Liverpool, J. H. Rhodes & Co.

LOGWOOD EXTRACT—20 csk., Black River, J. Campbell, 10 csk., Black River, Order; 61 csk., Kingston, West Indies Chemical Works.

LITHOPONE—155 csk., Antwerp, E. M. & F. Waldo; 100 csk., Antwerp, B. Moore & Co.; 97 bbl., Antwerp, E. M. & F. Waldo.

MANGROVE BARK EXTRACT—4,000 bg., Singapore, Order.

MAGNESITE—148 csk., Rotterdam, H. J. Baker & Bros.; 250 bg. and 81 bbl., Rotterdam, A. Kramer & Co.

MYROBALANS — 1,410 pkt., Calcutta, National City Bank.

NAPHTHALENE—25 csk. flake, Hull, Order; 470 double bg., Rotterdam, Lunham & Reeve; 208 bg., Manchester, Order; 2,085 bg., Antwerp, Order.

OCHER—50 csk., Marseilles, Gledkill & Co.; 232 csk., Marseilles, American Exchange National Bank; 335 csk., Marseilles, Reichard-Coulston, Inc.; 125 csk., Marseilles, Order.

OILS—Cod—100 bbl., Hull, Cook & Swan Co.; 300 bbl., Hull, Order. **Coconut**—868,680 kilos (in bulk), Manila, Order; 675 tons (in bulk), Manila, Philippine Refining Co. **China Wood**—150 csk., Hankow, Brown Bros. & Co.; 300 csk., Hankow, Determann & Co. **Linseed**—114 dr., Rotterdam, W. VanDoorn. **Olive Foots** (sulphur oil)—200 bbl., Milazzo, Philadelphia National Bank; 200 bbl., Milazzo, Equitable Trust Co.; 100 bbl., Milazzo, Order; 115 bbl., Catania, Order; 200 bbl., Palermo, Brown Bros. & Co.; 350 bbl. Naples, Mechanics & Metals National Bank; 35 bbl., Malaga, Nat'l City Bank; 150 bbl., Malaga, Bank of the Manhattan Co. **Palm Kernel**—250 bbl., Hull, Order. **Palm**—16 csk., Rotterdam, Order. **Rapeseed** — 350 bbl., Hull, Vacuum Oil Co.; 245 bbl. refined, Hull, Order; 105 bbl. crude, Hull, Order; 50 bbl., London, W. B. Dick & Co. **Sesame**—100 bbl., Rotterdam, Order; 60 bbl., Genoa, Order; 293 bbl., Manchester, Order.

OIL SEEDS—Castor—5,851 bg., Cocanada, Order. **Linseed**—50,991 bg., Santa Fe, L. Dreyfus & Co.; 48,856 bg., Diamante, L. Dreyfus & Co.; 29,134 bg., Buenos Aires, L. Dreyfus & Co.; 3,579 bg., Buenos Aires, L. Dreyfus & Co.; 2,270,828 kilos and 18,328 bg., Buenos Aires, Order; 5,815 tons, Rosario, Spencer Kellogg & Sons.

PHOSPHORUS—200 cs., Antwerp, W. E. Miller.

POTASSIUM SALTS—261 csk. alum, Rotterdam, A. Klipstein & Co.; 102 csk. alum, Rotterdam, Superfos Co.; 240 csk. alum, Rotterdam, Order; 60 csk. nitrate, and 175 csk. alum, Rotterdam, Order; 833 bg. sulphate, Antwerp, Societe Comm. des Potasses D'Alsace; 3,490 bg. muriate and 2,000 bg. manure salt, Antwerp, Societe Comm. des Potasses D'Alsace; 18 csk. prussiate, Liverpool, C. Tennant & Sons Co.; 200 bg. nitrate, Antwerp, Bank of America; 5 cs. cyanide, Antwerp, C. Hardy, Inc.; 16 bbl. yellow prussiate, Antwerp, E. Suter & Co.

PUMICE—1,947 bg., Canneto Lipari, K. F. Griffin & Co.; 1,895 bg., Canneto Lipari, Gallagher & Ascher; 329 pkg., Canneto Lipari, Order.

PYRIDINE—9 dr., Rotterdam, Lunham & Reeve.

QUICKSILVER — 100 flasks, Leghorn, Order.

QUEBRACHO—1,050 bg., Buenos Aires, Second National Bank of Boston; 3,169 bg., Buenos Aires, First National Bank, Boston; 1,996 bg., Buenos Aires, Equitable Trust Co.; 60 bg., Buenos Aires, M. E. Clarendon & Sons.

ROSIN—32 scroons, Samana, L. Missi.

SAL AMMONIAC—31 csk., Rotterdam, E. Suter & Co.; 188 csk., Rotterdam, Kuttroff, Pickhardt & Co.; 64 csk., Rotterdam, Roessler & Hasslacher Chem. Co.

SHELLAC—8 cs., Rotterdam, M. F. Gerlach; 50 bg., Havre, Doherr, Grimm & Co.; 425 bg., Calcutta, British Bank of South Am.; 200 bg., Calcutta, National City Bank; 225 pkg., Calcutta, Irvai & Co.; 200 bg., Calcutta, Maclac Co.; 700 bg., Calcutta, Order; 146 bg. and 50 cs., Marseilles, Order; 45 cs., Barcelona, Order.

SILICA—60 bg., Marseilles, Order.

SILVER SULPHIDE — 9 cs., South Pacific Ports, Goldsmith & Co.

SODIUM SALTS—100 cylinders chlorate, Havre, C. Hardy, Inc.; 70 csk. fluoride, Rotterdam, E. Suter & Co.; 225 csk. nitrate, Rotterdam, Kuttroff, Pickhardt & Co.; 77 csk. phosphate, Rotterdam, Roessler & Hasslacher Chemical Co.; 30 csk. yellow prussiate, Rotterdam, Superfos Co.; 250 bg. phosphate, Antwerp, Order; 508 bg. silico fluoride, Copenhagen, Order; 100 cs. cyanide, Liverpool, American British Chemical Supply, Inc.; 33 cs. do, Liverpool, Order; 28 cs. peroxide, Havre, C. Hardy, Inc.

(*Continued on page 574*)

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums, wks.	lb.	$0.16 –	$0.17
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.37 –	3.62
Acetic, 56%, bbl.	100 lb.	6.35 –	6.60
Acetic, 80%, bbl.	100 lb.	8.90 –	9.15
Glacial, 99½%, bbl.	100 lb.	11.90 –	12.15
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.46 –	.47
Formic, 85%	lb.	.13 –	.13½
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½ –	.13
22% tech., light, bbl.	lb.	.06 –	.06½
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04¾ –	.05¼
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.10½ –	.11
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	10.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	14.00 –	15.00
Sulphuric, 66° drums	ton	19.00 –	20.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.27 –	.28
Tartaric, domestic, bbl.	lb.	.30 –	....
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.30 –	.35
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.85 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.81 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½ –	...
No. 1, 190 proof, special, dr.	gal.	.45½ –	...
No. 1, 188 proof, bbl.	gal.	.52½ –	...
No. 1, 188 proof, dr.	gal.	.48½ –	...
No. 5, 188 proof, bbl.	gal.	.50½ –	...
No. 5, 188 proof, dr.	gal.	.44½ –	...
Alum, ammonia, lump, bbl.	lb.	.03½ –	.04
Potash, lump, bbl.	lb.	.03¼ –	.03¾
Chrome, lump, potash, bbl.	lb.	.05½ –	.06
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.06½ –	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12 –	.13
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.25 –	3.75
Antimony oxide, white, bbl.	lb.	.10 –	.10½
Arsenic, white, powd., bbl.	lb.	.11¼ –	.11½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	67.00 –	68.00
Barium chloride, bbl.	ton	85.00 –	90.00
Barium dioxide, 88%, drums	lb.	.17½ –	.18
Barium nitrate, casks	...	.08 –	.08½
Blanc fixe, dry, bbl.	lb.	.03¾ –	.04
Bleaching powder, f.o.b. wks., drums	100 lb.	1.90 –	....
Spot N. Y. drums	100 lb.	2.25 –	2.35
Borax, bbl.	lb.	.05½ –	.05½
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	3.50 –	3.55
Calcium arsenate, dr.	lb.	.11 –	.11½
Calcium carbide, drums	lb.	.05 –	.05¼
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.76½ –	.77
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.07½ –	.08
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04½
Domestic, heavy, bbl.	lb.	.03¾ –	.04
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks.	lb.	.04½ –	....
Contract, tanks, wks.	lb.	.04½ –	....
Cylinders, 100 lb., wks.	lb.	.05½ –	.07½
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.00 –	18.00
Copper carbonate, bbl.	lb.	.17½ –	.18
Copper cyanide, drums	lb.	.45 –	.46
Coppersulphate, dom., bbl.	100 lb.	4.85 –	5.00
Imp bbl.	100 lb.	4.60 –	....
Cream of tartar, bbl.	lb.	.21 –	.22
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1.10 –	1.15
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., dr.	lb.	.14 –	.15
Ethyl acetate, 85%, drums	gal.	1.00 –	....
Ethyl acetate, 99%, dr.	gal.	$1.15 –	....
Formaldehyde, 40%, bbl.	lb.	.11 –	.11½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.25 –	....
Fusel oil, ref., drums	gal.	3.50 –	....
Fusel oil, crude, drums	gal.	2.50 –	2.75
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.95 –	1.05
Glycerine, c.p., drums extra	lb.	.17 –	....
Glycerine, dynamite, drums	lb.	.16 –	....
Glycerine, crude 80%, loose	lb.	.11 –	....
Hexamethylene, drums	lb.	.68 –	.75
Lead:			
White, basic carbonate, dry, casks	lb.	.10½ –	....
White, basic sulphate, casks	lb.	.09¾ –	....
White, in oil, kegs	lb.	.12¾ –	....
Red, dry, casks	lb.	.12 –	....
Red, in oil, kegs	lb.	.13¾ –	....
Lead acetate, white crys., bbl.	lb.	.15 –	....
Brown, broken, casks	lb.	.14 –	....
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.11½ –	....
Lithopone, bags	lb.	.06¾ –	.06¾
Magnesium carb., tech., bags	lb.	.08¼ –	.08½
Methanol, 95%, bbl.	gal.	.90 –	.93
Methanol, 97%, bbl.	gal.	.93 –	.95
Methanol, pure, tanks	gal.	.90 –	....
drums	gal.	1.00 –	....
bbl.	gal.	1.05 –	....
Methyl-acetone, t'ks.	gal.	.90 –	.91
Nickel salt, double, bbl.	lb.	.09¾ –	.10½
Nickel salts, single, bbl.	lb.	.10 –	.11
Orange mineral, csk.	lb.	.14½ –	.15¼
Phosgene	....	.69 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½ –	.09¾
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ –	.06¾
Potassium chlorate, powd.	lb.	.07½ –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08 –	.08½
Potassium hydroxide (caustic potash) drums	lb.	.06½ –	.06¾
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07½ –	.09
Potassium permanganate, drums	lb.	.14 –	.14½
Potassium prussiate, red, casks	lb.	.43 –	.45
Potassium prussiate, yellow, casks	lb.	.19½ –	.20
Salammoniac, white, gran., casks, imported	lb.	.06¾ –	....
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk) works	ton	22.00 –	....
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.00 –	....
Sodium acetate, works, bbl.	lb.	.05 –	.05½
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½ –	.07¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb	.04½ –	.04½
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22
Sodium fluoride, bbl.	lb.	$0.09 –	$0.10¾
Sodium hyposulphite, bbl.	lb.	.02½ –	.02¾
Sodium nitrite, casks	lb.	.08¼ –	.08½
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.03¾
Sodium prussiate, yel. bbl.	lb.	.10½ –	.12
Sodium salicylic, drums	lb.	.40 –	.42
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03¼ –	.03½
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03¾
Strontium nitrate, powd., bbl.	lb.	.10 –	.10½
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08
Tin bichloride, bbl.	lb.	.14 –	.....
Tin oxide, bbl.	lb.	.58 –	.....
Tin crystals, bbl.	lb.	.35½ –	.....
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.05 –	.05½
Zinc cyanide, drums	lb.	.36½ –	.37
Zinc dust, bbl.	lb.	.08 –	.08½
Zinc oxide, lead free, bag	lb.	.07¾ –	.....
5% lead sulphate, bags	lb.	.07½ –	.....
10 to 35 % lead sulphate, bags	lb.	.07 –	......
French, red seal, bags	lb.	.09¾ –	......
French, green seal, bags	lb.	.10¾ –	......
French, white seal, bbl.	lb.	.12 –	......
Zinc sulphate, bbl.	100 lb.	3.00 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.65
Alpha-naphthol, ref., bbl.	lb.	.70 –	.75
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthraquinone, 25%, paste, drums	lb.	.75 –	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 –	.....
f.f.c. drums	lb.	1.60 –	.....
tech, drums	lb.	70	.....
Benzene, pure, water-white, tanks, works	gal.	.25 –	....
Benzene, 90%, tanks, works	gal.	.23 –	....
Benzidine base, bbl.	lb.	.80 –	.82
Benzidine sulphate, bbl.	lb.	.70 –	.72
Benzoic acid, U.S.P., kegs	lb.	.82 –	85
Benzoate of soda, U.S.P., bbl.	lb.	65 –	70
Benzyl chloride, 95-97%, ref., carboys	lb.	.35 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.25 –	.26
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresol, U.S.P., drums	lb.	.23 –	28
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.68 –	.72
95-97%, drums, works	gal.	.65 –	.68
Dichlorbenzene, drums	lb.	.07 –	.08
Diethylaniline, drums	lb.	.53 –	.55
Dimethylaniline, drums	lb.	.36 –	.38
Dinitrobenzene, bbl.	lb	.18 –	20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal	.26 –	.28
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.72 –	.75
Meta-phenylenediamine, bbl.	lb.	.95 –	1.00
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06 –	.06½
Naphthalene, balls, bbl.	lb.	.07 –	.07½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.25 –	.30
Nitro-toluene, drums	lb.	.13½ –	.14
N-W acid, bbl.	lb.	1.05 –	1.10
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	.15
Ortho-nitrophenol, bbl.	lb.	1.25 –	1.30
Ortho-nitrotoluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.13 –	.14
Para-aminophenol, base, kegs	lb.	1.25 –	1.35
Para-aminophenol, HCl, kegs	lb.	1.45 –	1.60
Para-dichlorbenzene, bbl.	lb.	.17 –	20
Paranitraniline, bbl.	lb.	.68 –	.70
Para-nitrotoluene, bbl.	lb.	.58 –	.60
Para-phenylenediamine, bbl.	lb.	1.40 –	1.50
Para-toluidine, bbl.	lb.	.76 –	.83
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.26 –	.29
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	3.50 –	3.75
Resorcinol, tech., kegs	lb.	1.30 –	1.40

Resorcinol, pure, kegs	lb.	$2.05 –	$2.10
R-salt, bbl	lb.	.55 –	.60
Salicylic acid, tech., bbl	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl	lb.	.35 –	..
Solvent naphtha, water-white, tanks	gal.	.25 –	....
Crude, tanks	gal.	.22 –	....
Sulphanilic acid, crude, bbl	lb.	.16 –	.18
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	....
Toluene, drums, works	gal.	.30 –	....
Xylidine, drums	lb.	.50 –	....
Xylene, pure, tanks	gal.	.40 –	....
Xylene, com., tanks	gal.	.28 –	....

Naval Stores

Rosin B-D, bbl	280 lb.	$5.75 –	$5.80
Rosin E-I, bbl	280 lb.	5.75 –	5.80
Rosin K-N, bbl	280 lb.	5.90 –	6.10
Rosin W.G.-W.W., bbl	280 lb.	6.95 –	7.35
Wood rosin, bbl	280 lb.	5.80 –	5.90
Turpentine, spirits of, bbl	gal.	1.01 –	......
Wood, steam dist., bbl	gal.	.90 –	......
Wood, dest. dist., bbl	gal.	.70 –	......
Pine tar pitch, bbl	200 lb.	5.50 –	......
Tar, kiln burned, bbl	500 lb.	11.00 –	......
Retort tar, bbl	500 lb.	11.00 –	......
Rosin oil, first run, bbl	gal.	.41 –	......
Rosin oil, second run, bbl	gal.	.45 –	......
Rosin oil, third run, bbl	gal.	.47 –	......
Pine oil, steam dist	gal.	.65 –	......
Pine tar oil, ref	gal.	.50 –	......

Animal Oils and Fats

Degras, bbl	lb.	$0.03½ –	$0.05½
Grease, yellow, loose	lb.	.06½ –	.07
Lard oil, Extra No. 1, bbl	gal.	.85 –	......
Lard compound, bbl	lb.	.11½ –	.12
Neatsfootoil 20 deg. bbl	gal.	1.28 –	......
No. 1, bbl	gal.	.88 –	.92
Oleo Stearine	...	.09½ –	......
Oleo oil, No. 1, bbl	lb.	.12¼ –	.12¾
Red oil, distilled, d.p. bbl	lb.	.08½ –	.08¾
Saponified, bbl	lb.	.08½ –	.08¾
Tallow, extra, loose	lb.	.07½ –	......
Tallow oil, acidless, bbl	gal.	.83 –	......

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.15 –	......
Castor oil, No. 1, bbl	lb.	.15½ –	......
Chinawood oil, bbl	lb.	.16 –	.16½
Coconut oil, Ceylon, bbl	lb.	.09½ –	......
Ceylon, tanks, N.Y.	lb.	.08½ –	.08¾
Coconut oil, Cochin, bbl	lb.	.10 –	.10¼
Corn oil, crude, bbl	lb.	.10½ –	.11
Crude, tanks, (f.o.b. mill)	lb.	.08¼ –	.08½
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08¼ –	.08½
Summer yellow, bbl	lb.	.10½ –	......
Winter yellow, bbl	lb.	.11¼ –	.11½
Linseed oil, raw, car lots, bbl	gal.	.90 –	......
Raw, tank cars (dom.)	gal.	.84 –	......
Boiled, cars, bbl. (dom.)	gal.	.92 –	......
Olive oil, denatured, bbl	gal.	1.25 –	1.30
Sulphur, (foots) bbl	lb.	.09½ –	.10
Palm, Lagos, casks	lb.	.07½ –	.07¾
Niger, casks	lb.	.06½ –	....
Palm kernel, bbl	lb.	.09½ –	....
Peanut oil, crude, tanks (mill)	lb.	.11½ –	....
Peanut oil, refined, bbl	lb.	.14½ –	.15
Perilla, bbl	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl	gal.	.90 –	....
Sesame, bbl	lb.	.11½ –	.11¾
Soya bean (Manchurian), bbl	lb.	.11½ –	....
Tank, f.o.b. Pacific coast	lb.	.10 –	.10¼
Tank, (f.o.b. N.Y.)	lb.	.10½ –	..

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.64 –	$0.66
Menhaden, light pressed, bbl	gal.	.60 –	......
White bleached, bbl	gal.	.62 –	......
Blown, bbl	gal.	.66 –	......
Crude, tanks (f.o.b. factory)	gal.	...... –	......
Whale No. 1 crude, tanks, coast	lb.	...... –	......
Winter, natural, bbl	gal.	.75 –	.76
Winter, bleached, bbl	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 –	....
Cottonseed meal, f.o.b. mills	ton	38.00 –	....
Linseed cake, bags	ton	35.00 –	36.00
Linseed meal, bags	ton	38.00 –	40.00

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochineal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.13½ –	.14½
Dextrine, corn, bags	100 lb.	3.74 –	3.94
Dextrine, gum, bags	100 lb.	4.09 –	4.19
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.10½ –	.11½
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	....	....
Sumac, ground, bags	ton	135.00 –	140.00
Sumac, domestic, bags	ton	50.00 –	55.00
Starch, corn, bags	100 lb.	3.12 –	3.22
Tapioca flour, bags	lb.	.05½ –	.06½

Extracts

Archil, conc., bbl	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.01¾ –	.02¼
Divi-divi, 25% tannin, bbl	lb.	.04 –	.05
Fustic, crystals, bbl	lb.	.20 –	.22
Fustic, liquid, 42°, bbl	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09½ –	.10
Hematine crys., bbl	lb	.14 –	.18
Hemlock, 25% tannin, bbl	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl	lb.	.09½ –	.10½
Logwood, crys., bbl	lb.	.14 –	.15
Logwood, liq., 51°, bbl	lb.	.08 –	.09
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Osage Orange, powder, bg.	lb.	.14 –	.15
Quebracho, solid, 65% tannin, bbl	lb.	.05 –	.05¼
Sumac, dom., 51°, bbl	lb.	.06½ –	.07¾

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract	lb.	$0.07½ –	$0.09
spot, cases	lb.	.11 –	.15
Lampblack, bbl	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues-Bronze, bbl	lb.	.40 –	.43
Prussian, bbl	lb.	.40 –	.43
Ultramarine, bbl	lb.	.08 –	.35
Browns, Sienna, Ital., bbl	lb.	.06 –	.14
Sienna, Domestic, bbl	lb.	.03½ –	.04
Umber, Turkey, bbl	lb.	.04 –	.04½
Greens-Chrome, C.P. Light, bbl	lb.	.28 –	.30
Chrome, commercial, bbl	lb.	.12 –	.12½
Paris, bulk	lb.	.26 –	.28
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Iron oxide red, casks	lb.	.10 –	.16
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl	lb.	1.25 –	....
Yellow, Chrome, C.P. bbls	lb.	.16½ –	.17½
Ocher, French, casks	lb.	.02¼ –	.03

Waxes

Bayberry, bbl	lb.	$0.22 –	$0.23
Beeswax, crude, Afr. bg	lb.	.25 –	.26
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.38 –	.40
No. 2, North Country, bags	lb.	.28½ –	.29
No. 3, North Country, bags	lb.	.20 –	.21
Japan, cases	lb.	.23 –	.23½
Montan, crude, bags	lb.	.05½ –	.06
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.05½ –	....
Crude, scale 124-126 m.p. bags	lb.	.04¾ –	.05
Ref., 118-120 m.p., bags	lb.	.05¼ –	.05½
Ref., 123-125 m.p., bags	lb.	.05½ –	....
Ref, 128-130 m.p., bags	lb.	.05¾ –	....
Ref., 133-135 m.p., bags	lb.	.06 –	....
Ref., 135-137 m.p., bags	lb.	.06¼ –	.06½
Stearic acid, sgle pressed, bags	lb.	.11¼ –	.11½
Double pressed, bags	lb.	.11¾ –	.12
Triple pressed, bags	lb.	.13¼ –	.13½

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.85 –	....
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	.... –	....
Nitrate of soda, bags	100 lb.	2.52½ –	....
Tankage, high grade, f.o.b. Chicago	unit	2.50 –	2.60
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.30 –	4.20
Tennessee, 75%	ton	7.00 –	7.25
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	45.85 –	....
Double manure salt	ton	27.00 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.18 –	....
Upriver coarse	lb.	.14 –	....
Upriver caucho ball	lb.	.16½ –	....
Plantation—First latex crepe	lb.	.24 –	....
Ribbed smoked sheets	lb.	.23½ –	....
Amber crepe No. 1	lb.	.23¾ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.20 –	.21
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.26½ –	.27½
Singapore, No. 1, cases	lb.	.31 –	.32
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb	.62 –	.64
Ordinary chips, cases	lb.	.20½ –	.21½
Manjak, Barbados, bags	lb.	.08 –	.11

Shellac

Shellac, orange fine, bags	lb.	$0.59 –	$0.60
Orange superfine, bags	lb.	.61 –	.62
A. C. garnet, bags	lb.	.58 –	....
Bleached, bonedry	lb.	.67 –	....
Bleached, fresh	lb.	.56 –	....
T. N., bags	lb.	.57 –	....

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$300.00 –	$400.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	50.00 –	70.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl	net ton	16.00 –	17.00
Barytes, grd., off-color, f.o.b. Balt	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl	net ton	23.00 –	24.00
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	8.50
Casein, bbl., tech	lb.	.11 –	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.50 –	9.00
Powd., f.o.b. Ga.	net ton	13.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 –	7.00
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 soap	long ton	7.00 –	....
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	....
Graphite, Ceylon, lump, first quality, bbl	lb.	.05½ –	.06
Ceylon, chip, bbl	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.11 –	.11½
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.35 –	1.40
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00 –	45.00
Pumice stone, imp., casks	lb.	.03 –	.35
Dom., lump, bbl	lb.	.05 –	.05½
Dom., ground, bbl	lb.	.05 –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	....
Silica, glass sand, f.o.b. Ill.	ton	1.75 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.50 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.00 –	....
Talc, 200 mesh, f.o.b. Ga., bags	ton	8.00 –	12.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75 –	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$4.00 –	$4.50
Corning	bbl.	2.15 –	......
Cabell	bbl.	2.20 –	......
Somerset	bbl.	2.30 –	2.50
Illinois	bbl.	2.07 –	......
Indiana	bbl.	2.08 –	......
Kansas and Okla. under 28 deg.	bbl.	1.00 –	......
California, 35 deg. and up	bbl.	1.40 –	......

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.20 –	......
Naphtha, V. M. & P. deod, steel bbls	gal	.19 –	......
Kerosene, ref. tank wagon	gal.	.15 –	......
Bulk, W.W. delivered, N.Y.	gal.	.08½ –	.09
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.32 –	.38
Bloomless, 30@31 grav.	gal.	.20 –	....
Paraffin, pale	gal.	.18 –	.18½
Spindle, 200, pale	gal.	.22 –	....
Petrolatum, amber, bbls	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa.	1,000	42–45
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00 –	......

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –	....
4-6% C	lb.	.11½–	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	107.50 –	....
Spiegeleisen, 19-21% Mn	gr. ton	38.00 –	40.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	41.50 –	46.50
50%	gr. ton	75.00 –	80.00
Ferrotungsten, 70-80%, per lb. of W	lb.	.91 –	.93
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	19.50 –	24.00
Coke, fdry., f.o.b. ovens	ton	5.00 –	5.50
Coke, furnace, f.o.b. ovens	ton	3.75 –	4.00
Fluorspar, gravel, f.o.b. mines, Illinois	ton	23.50 –	....
Ilmenite, 52% TiO_2 Va.	lb.	.01½–	....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.44 –	.46
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 –	....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	....
Rutile, 95% TiO_2	lb.	.12 –	.15
Tungsten, scheelite, 60% WO_3 and over	unit	10.00 –	....
Tungsten, wolframite, 60% WO_3	unit	9.00 –	9.25
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	2.50
Vanadium pentoxide, 99%	lb.	2.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13½–$0.13⅝
Aluminum, 98 to 99%	lb.	.27 – .28
Antimony, wholesale, Chinese and Japanese	lb.	.10¾– .11
Nickel, 99%	lb.	.28 – .32
Monel metal, shot and blocks	lb.	.32
Tin, 5-ton lots, Straits	lb.	.51⅞
Lead, New York, spot	lb.	.09
Lead, E. St. Louis, spot	lb.	.08625
Zinc, spot, New York	lb.	.0647½
Zinc, spot, E. St. Louis	lb.	.0612½
Silver (commercial)	oz.	.63⅝
Cadmium	lb.	.70–.75
Bismuth (500 lb. lots)	lb.	2.35
Cobalt	lb.	2.50-3.00
Magnesium, ingots, 99%	lb.	.90–.95
Platinum	oz.	120.00
Iridium	oz.	270.00–275.00
Palladium	oz.	83.00
Mercury	75 lb.	72.00–73.00
Tungsten powder	lb.	.95–1.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.25
Copper bottoms	30.25
Copper rods	20.75
High brass wire	18.75
High brass rods	16.00
Low brass wire	20.50
Low brass rods	21.00
Brazed brass tubing	24.50
Brazed bronze tubing	25.75
Seamless copper tubing	23.75
Seamless high brass tubing	22.50

OLD METALS—The following are the dealers purchasing prices in cents per pound

Copper, heavy and crucible	11.50 @ 12.00
Copper, heavy and wire	11.00 @ 11.25
Copper, light and bottoms	9.00 @ 9.25
Lead, heavy	7.87½ @ 8.12½
Lead, tea	6.00 @ 6.25
Brass, heavy	6.00 @ 6.25
Brass, light	5.00 @ 5.25
No. 1 yellow brass turnings	7.00 @ 7.25
Zinc scrap	4.00 @ 4.25

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3.64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

FAIRFIELD—The Tennessee Coal, Iron & Railroad Co., Birmingham, is said to be arranging an appropriation of close to $4,500,000 for extensions and improvements at its local plant, to include additional furnaces, open-hearth mill and sheet mill, with a number of auxiliary structures. The sheet mill will be equipped for the production of corrugated sheets, both black and galvanized material. George G. Crawford is president.

BIRMINGHAM—The Air Reduction Co., Inc., 342 Madison Ave., New York, manufacturer of industrial gases, acetylene apparatus, etc., is perfecting plans for the construction of a new plant on site selected at North Birmingham, to consist of a number of units, estimated to cost approximately $500,000, including equipment. Francisco & Jacobus, 511 Fifth Ave., New York, are architects and engineers.

California

SAN FRANCISCO—The Pacific Portland Cement Co., Consolidated Pacific Bldg., has arranged an expansion program to involve close to $2,000,000. The work will include a new plaster mill at Gerlach, Nev., on which work has been started, to be equipped for an output of about 500 tons per day; a similar mill on site in southern California, to cost about $750,000, with like capacity; and a new grit mill at Redwood City, Calif., in the oyster shell bed district on the tidelands, on which construction is in progress, to have a capacity of 2,500 bbl. per day. The output will be used for increased production at the cement mill. The company has arranged for a sale of stock to total $2,000,000, a portion of the fund to be used for the expansion. Robert B. Henderson is president.

Connecticut

POQUONOCK—The Poquonock Paper Co., recently formed with a capital of $300,000, has taken over the local plant of the Hartford Paper Co. and plans to develop the mill for the manufacture of high-grade papers. Improvements will be made in the property for maximum capacity. George A. Leavitt is president, and Edward J. Manning, vice-president and general manager.

ROCKY HILL—The Bellamose Corp., Hartford, Conn., manufacturer of artificial silk, is planning for the early installation of laboratory equipment in the building at its local works, now in course of construction, to be devoted to this purpose. Complete apparatus for chemical and affiliated experimental work will be installed. A power house is also in course of erection, as well as main plant structures. The entire project will involve about $400,000. F. A. Hill is manager.

Georgia

MACON—The General Reduction Co., Dry Branch, Ga., has plans for the construction of a plant on property near Macon, for the production of fullers earth, bleaching clays and kindred products. The initial works will consist of two main buildings, 70x245 ft. and 65x200 ft., respectively, with machinery installation estimated to cost close to $40,000, including screening and pulverizing apparatus, elevating and conveying equipment, steam shovels, etc. It is expected to develop a capacity of about 40 tons per day. K. R. Slocum is general manager.

Indiana

ROCKPORT—The Rockport Pottery Co., recently organized with a capital of $100,000, has selected a local site and plans for the erection of a plant for the manufacture of a line of earthenware specialties. It will cost approximately $55,000. The new organization is headed by William Hewig, Paul H. Batt and G. H. Guthrie. It is represented by L. N. Savage, attorney, Rockport.

Louisiana

BATON ROUGE—The Baton Rouge Rubber Mfg. Co., 17 Old Reymond Bldg., lately formed with a capital of $500,000, is perfecting plans for the construction of a new plant on local site for the manufacture of a line of mechanical rubber specialties. It will be 1-story, 50x150 ft., estimated to cost close to $60,000, including equipment. It is expected to expand the works at a later date. M. L. Castay is president. Inquiries are being made for equipment.

Maryland

BALTIMORE—The Standard Sanitary Mfg. Co., Bessemer Bldg., Pittsburgh, Pa., manufacturer of enameled iron and other sanitary ware, has filed plans for the construction of a number of additional buildings at its proposed plant on 5th Ave., in the Canton section, initial structures for which are now in progress. The new units will be 1-story, consisting of two enameling shops, 62x345 ft., each; two cleaning and finishing shops, each 98x102 ft.; slush house, 35x85 ft.; and woodworking plant, 35x90 ft. The estimated cost of the group, including equipment, is placed at $300,000. Buildings now under way comprise a foundry, 100x590 ft.; machine shop, 100x250 ft.; and power house, 105x132 ft. The entire works will consist of 22 individual structures, with investment approximating $3,000,000. It is expected to have the first units ready for service in July.

Michigan

MUSKEGON—The Clover Foundry Co., 11th and Clay Sts., will soon take bids for the erection of a 1-story foundry addition, 60x170 ft., for the production of iron and other metal castings, estimated to cost $35,000. Vanderwest & Child, Montgomery Bldg., are architects. Charles S. Clover is president.

RAMSEY—The Castile Mining Co. will begin the erection of additions to its local plant to cost about $100,000, including equipment. A power house will be constructed.

Mississippi

WEST POINT—The West Point Tile Co. has plans for the erection of an addition to its plant for the manufacture of hollow building tile and drain tile, to be 17x150 ft., estimated to cost $25,000. Additional equipment will be installed. E. M. Powell is president.

New Jersey

NORTH BERGEN—The D. & P. Roofing Tile Co., 44 Polk St., Guttenberg, N. J., is taking bids for the erection of its proposed local plant on 28th St. for the production of composition roofing tile products. It will be 1-story, 30x100 ft., estimated to cost about $25,000. George Willaredt, 411 23rd St., West New York, N. J., is architect in charge.

New York

BUFFALO—William F. Schwartz, Room 5, Municipal Bldg., commissioner of public works, will take bids until April 14 for a quantity of liquid chlorine, as required by the department of water from May 1, 1924, to May 1, 1925, as per specifications on file. Bryan J. Boyle is deputy water commissioner.

QUEENS—Harral Products, Inc., 136-46 Havemeyer St., Brooklyn, manufacturer of soaps, washing compounds, etc., has leased property on Hawtree Creek Rd., near Rockaway Blvd., Queens, comprising seven factory buildingc on a 5-acre site, for a new plant. The structures total about 80,000 sq.ft. of floor space, and will be remodeled and improved by the Harral company, which will install complete equipment for production at an early date. It is expected to remove the present plant to the new location. The factories were used formerly as a cork works.

STAPLETON, S. I.—The New York & Richmond Gas Co. will make extensions and improvements in its artificial gas plant for considerable increase in output. Additions will be mode, also, in the distributing system. The company is disposing of a block of preferred stock to provide for the expansion.

Ohio

CINCINNATI—The Southern Agricultural Chemical Corp., 61 Broadway, New York, has awarded a general contract to the Ferro-Concrete Construction Co., Cincinnati, for the erection of its proposed new plant at Evendale, near Cincinnati, to be 4-story, 120x320 ft., estimated to cost $60,000. Work will be commenced at an early date.

GALION—The Galion Iron & Mfg. Co. has preliminary plans for the construction of a new local foundry for the production of iron and other metal castings, estimated to cost $55,000, including equipment.

OSBORN—The Wabash Portland Cement Co., Ford Bldg., Detroit, Mich., with plant at Stroh, Ind., is planning to begin work during the present month on its proposed local cement mill, to consist of a number of units, estimated to cost $1,500,000, with machinery. It will develop a capacity of close to 1,000,000 bbl. per annum. H. F. Jennings is secretary.

LORAIN—The National Tube Co. is perfecting plans for improvements in its blast-furnace department, including the rebuilding and relining of one of the units, and the installation of additional boiler and other equipment, to cost in excess of $400,000.

PORTSMOUTH—The Peebles Paving Brick Co., manufacturer of vitrified brick, has awarded a general contract to the Austin Co., Cleveland, for the rebuilding of the portion of its plant recently destroyed by fire with loss estimated at close to $100,000. The new plant with machinery will cost approximately $150,000.

STEUBENVILLE—The Ohio Valley Clay Co., manufacturer of refractory products, has tentative plans under advisement for the installation of electric-operated grinding equipment for handling blocks after burning. Work is under way on the installation of dust collectors. George W. Cochran is one of the heads of the company in charge.

Oklahoma

TULSA—The Boether Co., Denver, Colo., operating cement mills, is reported to be perfecting plans for the construction of a new plant on site selected near Tulsa, consisting of a main mill unit with three kilns, estimated to cost approximately $1,250,000. A power house and other mechanical departments will be installed. The property approximates 200 acres of rock and shale lands, and two electric shovels, gyratory rock crusher and hammer mill will be installed for raw material production. C. D. Nichols and M. O. Matthews are local representatives for the company.

Oregon

LIME—The Sun Portland Cement Co. has tentative plans under advisement for the erection of additions to its mill, to include the installation of a new kiln and auxiliary equipment.

Pennsylvania

PHILADELPHIA — The J. L. Prescott Co., 90 West Broadway, New York, manufacturer of stove polishes, etc., has acquired the local plant and business of the A-1 Mfg. Co., Front and Wharton Sts., manufacturer of polishes and chemicals, and will operate as a branch works. Improvements are under consideration.

CLEARFIELD—The Hyde City Nickel Alloy Co., Hyde City, near Clearfield, Pa., has tentative plans under advisement for the rebuilding of the portion of its plant destroyed by fire, March 23, with loss estimated at $27,000, including equipment.

HARRISBURG — The Air Reduction Sales Co., 342 Madison Ave., New York, manufacturer of industrial oxygen, gases, etc., is perfecting plans for the early erection of its proposed local plant on property purchased on Paxton St., totaling about 25,000 sq.ft. of floor space, estimated to cost $300,000, including equipment. Francisco & Jacobus, 511 5th Ave., New York, are architects and engineers.

WEST CHESTER—A bond issue of $100,000 will be passed upon by local voters on April 22, the proceeds to be used for the installation of a filtration plant at the municipal waterworks, as ordered by the State Department of Health. The City Council is in charge.

KESERY (Elk County)—The Glen Coal & Clay Products Co. has plans under way for the construction of a plant on its local properties, totaling about 250 acres of land, for the manufacture of tile products, estimated to cost $85,000, with equipment. It is purposed to give employment to about 100 operatives.

PHILADELPHIA—The Shallcross Co., 1450 Grays Ferry Ave., has filed plans for the erection of a 1-story addition to its plant, for which a general contract has been awarded to the Woodland Construction Co., 5925 Woodland Ave. The company specializes in the manufacture of inks and kindred products.

Texas

COLORADO — The Anderson-Prichard Oil Corp., of Oklahoma City, Okla., has purchased a local tract of about 12 acres of land as a site for a new oil-refining plant, for which plans will be prepared at an early date. It will have an initial capacity of 2,000 bbl. and is estimated to cost $175,000, including equipment. The company also plans for the construction of a pipe line from its oil properties to the new refinery, a distance of 14 miles. J. Steve Anderson is vice-president.

FORT WORTH—The Burton Concrete Co., recently organized, is perfecting plans for the construction of a local plant for the manufacture of cement and concrete bricks, tile, and kindred products, estimated to cost $50,000, including machinery. L. L. Burton is president, and F. H. Scott, secretary and treasurer.

Washington

SPOKANE—The Federal Match Corp. has plans in progress for the construction of a new addition to its local plant to more than double the present capacity. It is estimated to cost close to $150,000, with equipment.

HILLYARD—The Sinclair Refining Co., 111 West Washington St., Chicago, Ill., has work in progress on a new oil storage and distributing plant on site near the city, estimated to cost about $150,000, including equipment.

West Virginia

ST. ALBANS—The West Virginia Tire & Rubber Co., G. W. Hedrich, Beckley, W. Va., president, is reported to be perfecting plans for the early rebuilding of its local plant on Highland St., destroyed by fire a number of weeks ago, with loss estimated at $100,000, including equipment. The new structure will cost approximately a like amount.

Wisconsin

RACINE—The Belle City Malleable Iron Co. will start work early in May on its proposed 1-story foundry, 200x250 ft., to cost about $100,000, with equipment. Judson Stone is president.

New Companies

BENZOL PRODUCTS CO., Newark, N. J.; chemicals and chemical byproducts; 1,224 shares of stock, no par value. Incorporators: John C. Dehls, Leo Stein and Joseph Ebert, 13 Margaret St., Newark. The last noted is representative.

AMERICAN FIBRE CORP., Bluffs, Ill.; degumming of Bast fibers and production of byproducts; $15,000. Incorporators: H. G. Edwards, E. K. Devins and H. C. Knoeppel, all of Bluffs. Representative: Capps & Weaver, Farmers' State Bank Bldg., Pittsfield, Ill.

MERRITT CUT GLASS CO., Dunbar, W. Va.; glass products; capital stock not stated. Incorporators: C. P. Miller, Charleston, W. Va.; and D. P. Merritt, Dunbar. The last noted is representative.

BURTON CONCRETE PRODUCTS CORP., Fort Worth, Tex.; cement and concrete products; $70,000. Incorporators: L. L. and J. W. Burton, and F. H. Scott, all of Fort Worth.

PYRO-VAL CHEMICAL CO., Providence, R. I.; chemicals and chemical byproducts; $50,000. Incorporators: Charles McBride and Arthur E. Gray, 71 Byfield St., Providence. The last noted is representative.

R. J. WADDELL & CO., INC., New York; dry colors; $160,000. Incorporators: O. A. Hack, A. Meikeljohn and C. E. Goehring. Representative: R. B. Knowles, 165 Broadway, New York.

GRAHAME CHEMICAL CO., Trenton, N. J.; chemical products; $125,000. Incorporators: S. F. Acree, Edgar A. Slage and August Muhlhauser. Representative: Frederick R. Brace, 137 East State St., Trenton.

INTERSTATE REFINERIES, INC., Kansas City, Mo.; operate oil refineries; $50,000. Incorporators: R. H. Langley, Ralph R. Langley and Nels Pedersen. Representative: Ralph R. Langley, 310 First National Bank Bldg., Kansas City.

ILLINOIS METAL & REFINING CO., 2235 West Grand Ave., Chicago, Ill.; refined metals; 500 shares of stock, no par value. Incorporators: Bernard M. Epstein, A. Uttal and Mark D. Goodman.

EMBIE MFG. CO., Portland, Conn.; rubber products; $87,500. Incorporators: Thomas B. Barbour and Frank E. Magnuson, both of Portland; and Harry M. Burr, 86 Lawn Ave., Middletown, Conn.

SEGUIN COTTON OIL CO., Seguin, Tex.; cottonseed oil products; $100,000. Incorporators: Fred Bading and A. R. Maurer, both of Seguin.

OAK HARBOR GLASS CO., INC., Oak Harbor, O.; glass products; $65,000. Incorporators: George A. True and John H. Fisher, both of Oak Harbor.

UNIVERSAL MFG. CO., INC., Vineland, N. J.; washing fluids and kindred products; $5,000, nominal. Incorporators: Ralph C. Wilson, Benjamin Kravet and Morris V. McDonaid, 511 Landis Ave., Vineland. The last noted is representative.

HAYNES CHEMICAL CORP., Queens, N. Y.; chemicals, disinfectants, etc.; 500 shares of stock, no par value. Incorporators: M. McKenzie, G. Craig and M. P. Simmons. Representative: E. A. Freshman, 166 Montague St., Brooklyn, N. Y.

VALLEY RUBBER CO., Wheeling, W. Va.; rubber products, tires, etc.; $100,000. Incorporators: Thomas Mulholland and Joseph B. Doyle, both of Wheeling.

HIGHLAND REFRACTORIES, INC., Wilmington, Del., care of the American Guarantee & Trust Co., 1600 Delaware Ave., Wilmington, representative; refractory products; $1,250,000.

HOSSTON REFINING CO., Shreveport, La.; refined petroleum products; $45,000. George J. D'Arteis is president; and J. F. Knox, secretary and treasurer, both of Shreveport.

MIDVALE PAPER BOARD CO., New York; paperboard, cardboard and kindred paper specialties; $500,000. Representative: White & Case, 14 Wall St., New York.

CENTURY RUBBER SPECIALTY CO., 507 Gaither Estate Bldg., Baltimore, Md.; rubber products; $60,000. Incorporators: Ellis Herman and Louis Wolf.

BOARDMAN OIL & REFINING CO., Wichita Falls, Tex.; refined petroleum products; $15,000. Incorporators: L. L. and E. G. Boardman, and E. L. Foster, all of Wichita Falls.

FLEXOLIOD CO., Leominster, Mass.; composition products; $50,000. William E. Cavanaugh, president; and Frederic T. Platt, Leominster, treasurer and representative.

J. M. NURRE GLASS CO., Kansas City, Mo.; glass products; $50,000. Incorporators: Joseph M. Nurre (president), and H. M. Barbour (secretary), both of Kansas City.

Imports at New York

(Continued from page 570)

STRONTIUM NITRATE—109 csk., Rotterdam, Meteor Products Co.

SUMAC—1,350 bg. ground, Palermo, Order.

TALC—400 bg., Genoa, Bankers Trust Co.; 250 bg., Genoa, L. A. Salomon & Bros.; 250 bg., Genoa, Kountze Bros.; 650 bg., Genoa, Order; 100 bg., Havre, L. Isolantite; 200 bg., Genoa, L. A. Salomon & Bro.

TARTAR — 274 bg., Leghorn, Tartar Chemical Works; 112 bg., Genoa, Tartar Chemical Co.; 17 csk., Naples, Tartar Chemical Works; 105 bg., Marseilles, C. Pfizer & Co.

ULTRAMARINE BLUE—18 csk., Hull, Van Oppen & Co.; 250 cs., Hull, Reckitts, Ltd.; 15 csk., Hull, F. B. Vandegrift & Co.

UMBER—53 csk., Hull, L. H. Butcher & Co.

VALONEA—675 bg., Smyrna, A. Benadava; 340 bg., Smyrna, Order; 90,350 kilos do., Smyrna, First National Bank of Boston.

WAXES—37 bg. beeswax, Alexandria, Order; 14 pkg. do., Samana, etc., Order; 422 pkg. beeswax, Lisbon, Irving Bank-Col. Trust Co.; 89 bg. beeswax, Havana, Order.

WOOL GREASE—100 bbl., Hull Marden-Wild Corp.; 119 bbl., Antwerp, Mechanics & Metals National Bank; 180 bbl., Antwerp, Order.

ZINC OXIDE — 100 bbl., Marseilles, Order; 45 csk., Antwerp, A. Klipstein & Co.; 50 bbl., Antwerp, Philipp Bros., Inc.

ZINC RESINATE — 20 csk., London, Order.